GAS

JUNE 1959

Producer regulation and the distributor

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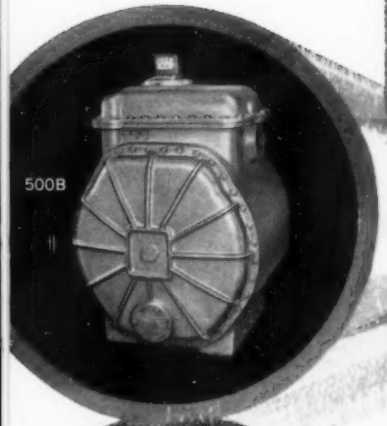

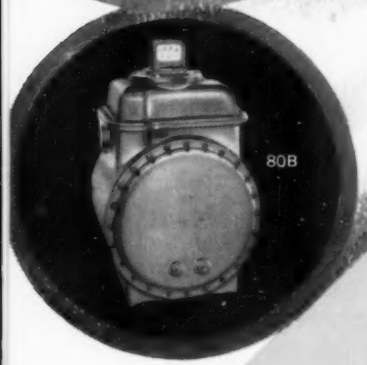

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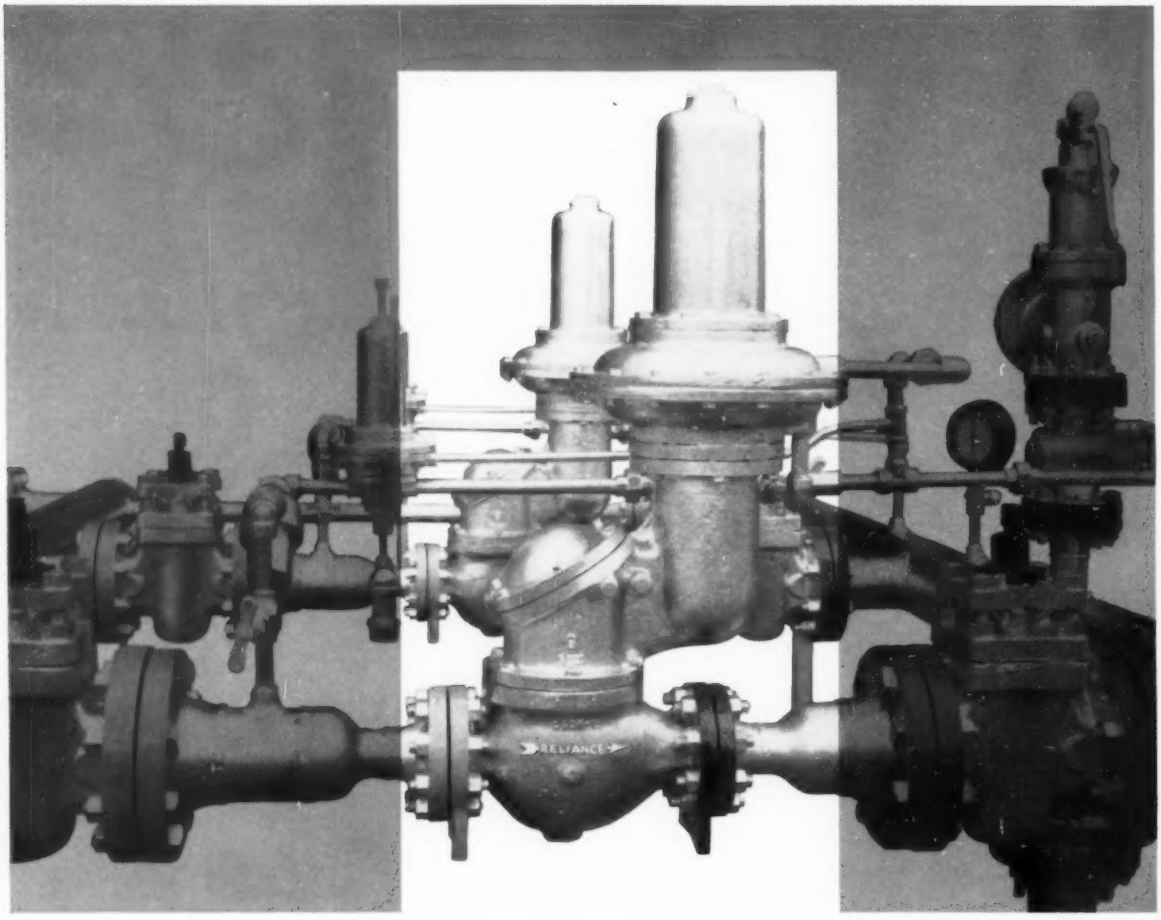

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BPA

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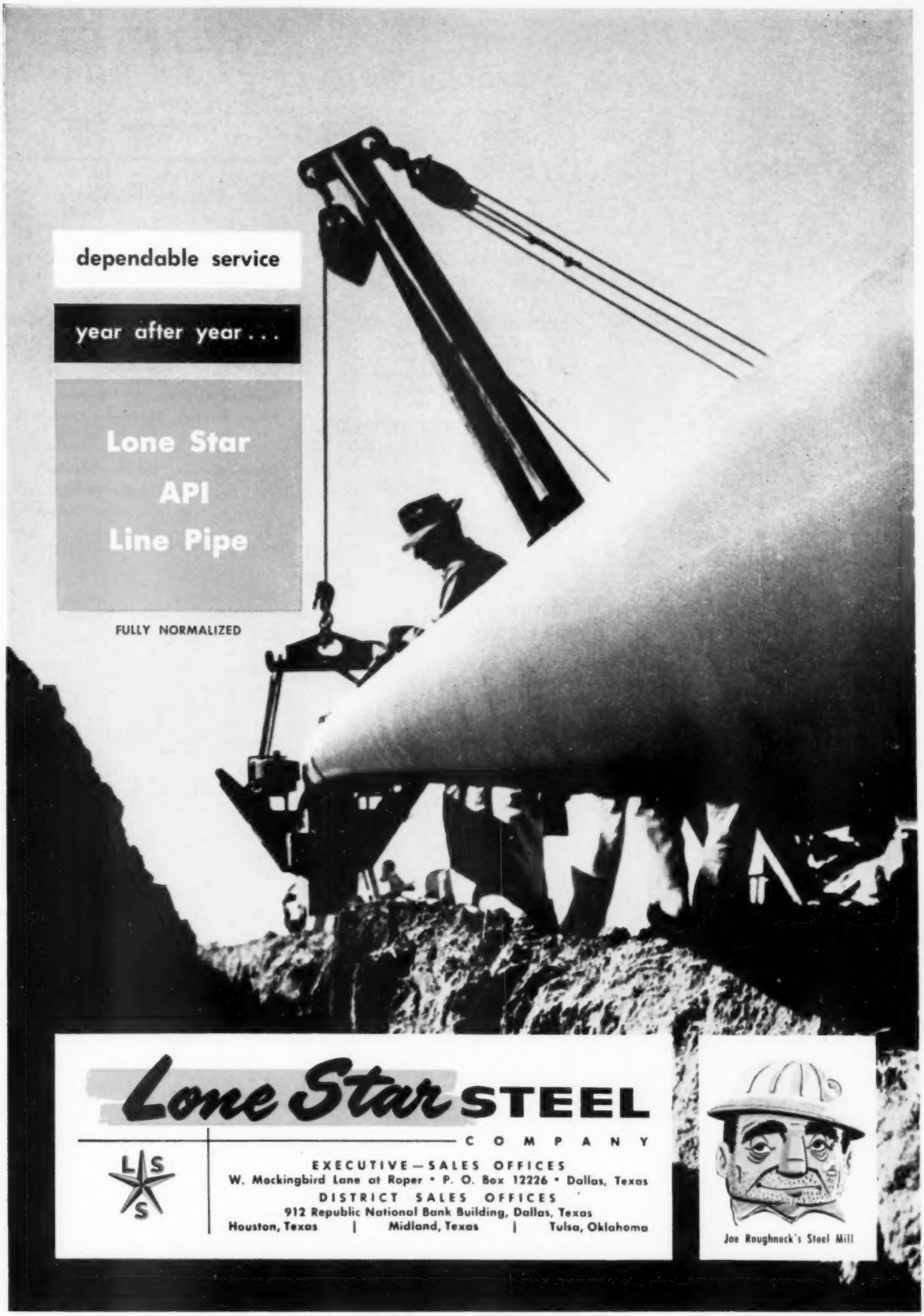
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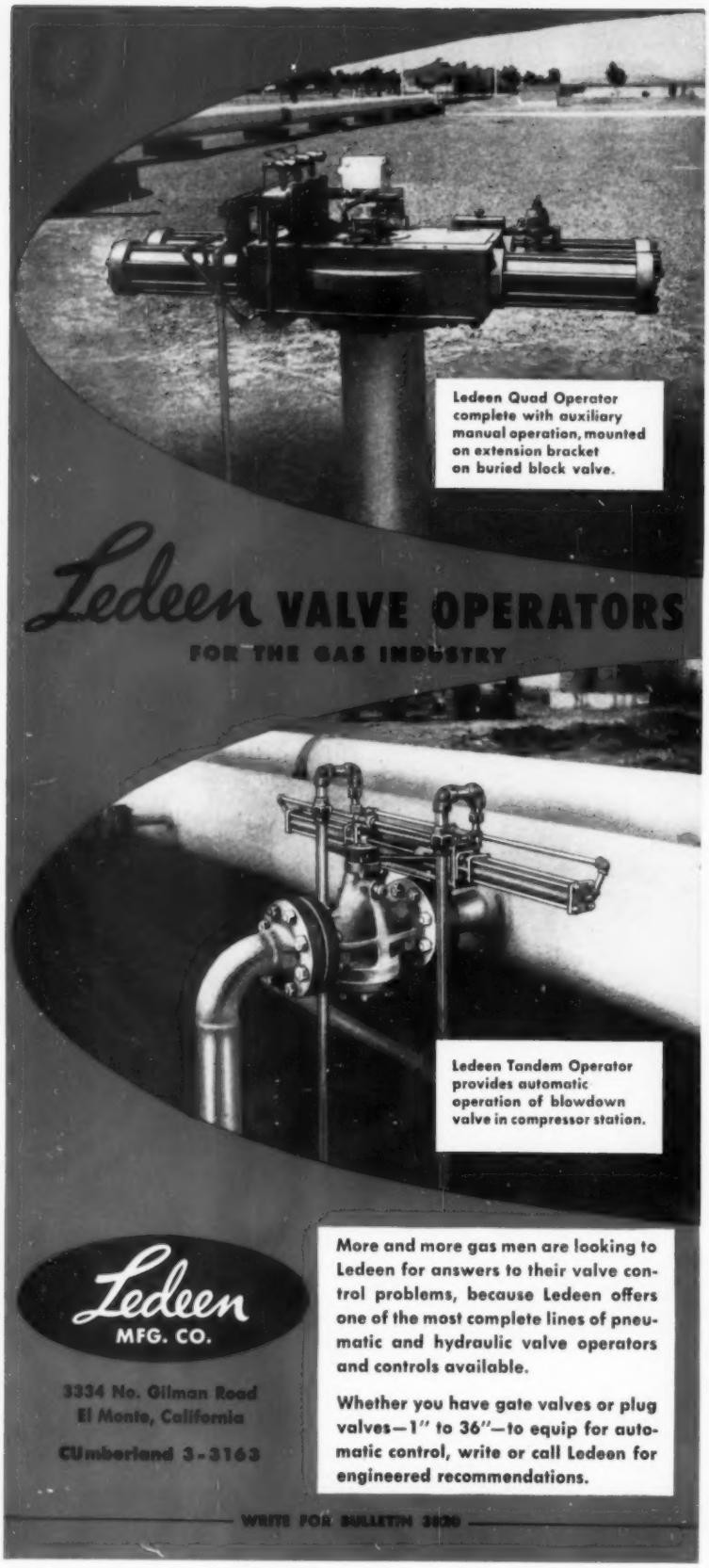
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GAS

JUNE 1959

Thermally Thinking

GREETINGS from the Argentine!

In all truth, this is being written from my home high in a suburb of Los Angeles where I am known as the Dahli Lama of Lower La Cañada. But as you are reading this I will be roaming around over a goodly part of Argentina. The purpose? To bring you an article on the design and construction of a big natural gas project that is rolling down here.

An 1100-mile mostly 24-in. OD pipeline is building away to bring natural gas from near the Argentine-Bolivia boundary, down through the center of the country, and into Buenos Aires—the largest city below the equator. YPF (for Yacimientos Petroliferos Fiscales) is the progressive gas and oil agency of the government that is responsible for this development in a country that many call "the young giant of South America."

My good friend Howard Walters of The Fish Engineering Corp., Houston, is making the trip with me. The Fish people are designers and prime contractors in this program. Howard and I will use a light plane to fly the right-of-way up to near Bolivia; then, we'll Jeep back down the entire 1100-mile route. I suspect that we will not miss a single mile in that Jeep, either.

One of the reasons I wanted to do this story is that I have learned that a lot of men in our industry don't care to look over the horizon. And they keep the "horizon" pulled in tight. They consider the gas business as an exclusive industry of the United States. Along with this there is the desire of many gasmen to limit their interests to their own operating division and specialty, to their city, to their state or certainly just to the shores of these United States.

Unfortunately, this may be true for other facets in the "American way of life." We generally are not a very "worldly" people.

So I hope this story from Argentina will have enough impact to wake up some people to the fact that the gas business is world-wide in scope. The recent successful shipment of natural gas in liquid phase from this country to England via water is just one experiment that emphasizes my point.

There are vast known natural gas reservoirs spotted about the world. To match this fact there are huge masses of population—or market—also spotted about the world. These major markets are not necessarily adjacent to the natural gas energy reserves. Fifty years ago, then, the latter fact would have eliminated the possibility of some of these markets getting together with some of this energy. But those days—and some call them the good old days—are gone forever.

As we know now, just in the past 20 years we started moving large volumes of gas from producing areas of the U. S. to market centers some distance removed. Anyway you slice it, the drive stimulating this accomplishment was, and still is, the bringing of energy resources and energy demand together. The key to the realization was the development of the technology and equipment to efficiently move natural gas as a commodity via pipeline.

Who knows where and how natural gas or energy produced and stored therefrom may be shipped in the next 20 to 50 years? Foreign natural gas will become a more important factor in your business life. Perhaps this will happen much sooner than any of us think.

Another reason I am on this trip is that the Chilton Co. (which owns GAS magazine and 16 others) doesn't want a bunch of feet-on-the-desk, office-type editors. This is reflected in GAS' "Eye Witness Editorial" policy. This philosophy of editing is in direct contrast with that of some competing specialized business magazines.

It really is a pretty small world these days. So we will continue to try to bring readers of GAS the finest, most up-to-date, and comprehensive on-the-spot articles from anywhere in the world, for—"Where gas goes, GAS goes."

Adios compadres!

J. Fred Edson

EDITOR

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GAS HIGHLIGHTS

Midwestern will start deliveries in November

Midwestern Gas Transmission Co. will start delivering 261 MMcf of gas per day to three customers in the Chicago area by Nov. 1. Both Midwestern and its parent, Tennessee Gas Transmission Co., should complete right-of-way work in June, and start actual construction in early July. Midwestern was certificated to build 350 miles of mainline from Portland, Tenn., to Joliet, Ill., and TGT to expand its system to serve Midwestern by FPC in mid-May. Midwestern will deliver to Chicago District Pipeline Co. at Joliet. Chicago District, in turn, will sell gas to Peoples Gas Light & Coke Co., Northern Indiana Public Service Co. and Northern Illinois Gas Co. The certificate authorizes Midwestern to deliver 360 MMcf per day at the start of the third year. Midwestern's 1959 construction will total $47.4 million; TGT will spend another $34.3 million to meet the Midwestern demand. Another $3.4 million will be spent by Midwestern on future expansion, while TGT has authority to build $27.2 million in additional facilities as Midwestern's demands increase. Still pending before FPC is the Midwestern proposal to build a line from the U. S.-Canadian border near Emerson, Man., to the Chicago area to import Canadian gas. No hearing date has been set on this yet.

Columbia Gulf plans experimental station

Columbia Gulf Transmission Co. plans to install a 4000-hp two-cycle turbocharged vertical gas engine to drive a centrifugal compressor—the first such application of a two-cycle engine in the gas industry. The unit, which will be located near Hampshire, Tenn., will be remotely controlled from Columbia Gulf's gas control center at Nashville. Object of the experiment will be to determine the economics and feasibility of this type of compressor drive. Clark Bros. Co., manufacturer of the compressor and engine, will install the equipment, while the pipeline will bear the costs of the remote control hookup. If the unit works out, the pipeline company has the option to buy it. Application for the project has been filed with FPC. Total cost is estimated at $1.6 million.

Canadian utilities plan more building

Canadian gas distribution companies will spend $82.1 million—second largest sum in history—to build new systems and expand present ones. Last year, Canadian utilities delivered 211.7 billion cu ft of gas to customers, largest total in history. This record seems a certainty to be shattered this year.

19 million homes heated with gas

More than 19 million U. S. homes are now heated with gas, AGA reports. At 1958's close, 19,003,000 homes were gas heated—a boost of six per cent over 1957. Nearly 65 per cent of all residential gas customers now use the fuel for heating. AGA also predicts that 4 million new heating customers will be added in the next three heating seasons. Sixty per cent of these will be new homes, the remaining 40 per cent will convert from other fuels.

Saskatchewan Power buys gas reserves

Canada's Saskatchewan Power Corp. is buying all of the gas reserves in the Many Islands field in Alberta. The provincially owned utility is acquiring the field from Britalta Petroleums and Crescent Corp., and will operate it through a subsidiary, Many Islands Pipe Lines Ltd. Saskatchewan Power also has agreed to sell 20 MMcf a day to Trans-Canada Pipe Lines, Ltd., for 15 years, starting in 1960.

Gas revenues grow for oil industry

Gas and gas liquids are now providing 23.5 per cent of the petroleum industry's total gross income, S. Cassell Barrett, Colorado Interstate Gas Co. vice president, told a recent API production session. In 1949, only 12 per cent of the petroleum industry's income came from this same source.

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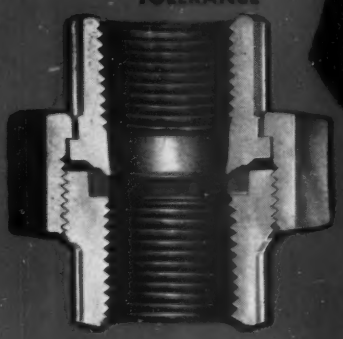

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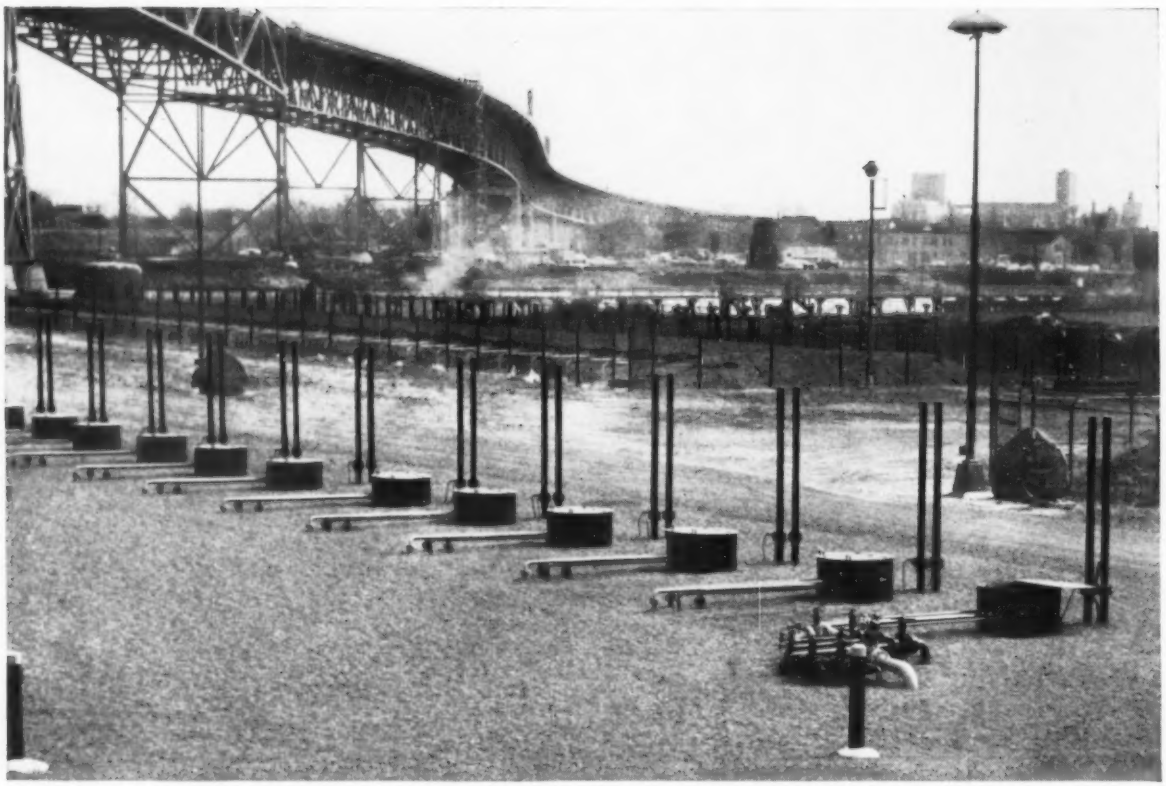

Just a row of pipes. That's all you can see of the LPG peak shaving plant J. F. Pritchard & Co. has built for The Peoples Gas Light and Coke Company at its Calumet terminal. Yet, insignificant as it may appear, this plant and another Pritchard has installed at the company's Crawford terminal have added 2,400,000 gallons of underground capacity to the LPG storage systems operated by this Chicago utility.

Pritchard has built more than 80 peak shaving plants with a capacity of over 40,000,000 gallons of LPG for firms all over the country. Other Pritchard specialties for the gas industry: compressor stations, dehydration plants, gas conditioning and treating plants.

But Pritchard specializes in more than the mere construction of facilities. Pritchard has the experience and staff to render a complete service—from the planning stages to the final construction of a turnkey job. Economic surveys, preliminary engineering, and procurement are examples of the range of services Pritchard offers.

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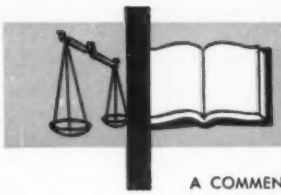


Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Fossil fuels fight fiercely

COAL and natural gas, as members of the fossil fuel family, are fighting fiercely for the industrial market. Gas has had a price advantage in many parts of the United States until recent years. Currently the impact of the rapid rise in field prices has placed gas at a competitive disadvantage with coal. The coal industry has employed very efficient methods of production during the last 10 years and has doubled the production rate from 5 to 10 tons for each man-day. In addition, the coal industry has asked Congress to amend the Natural Gas Act, so that gas cannot be sold to industry below cost. The future holds a comeback for coal.

The legislative objectives of the coal industry are intended to overcome the Federal Power Commission's position that it has no obligation to protect the coal industry from natural gas competition. A spokesman for the coal industry made a policy statement recently. He said that meeting the nation's needs for energy in the future requires the combined efforts of the many competing fuels. For wise use of America's resources the Federal government should encourage the most efficient use of available energy supplies through appropriate legislation and equitable administration of the law, asserted the spokesman. The public interest, he added, ". . . is not served by the dumping and the off-peak sale of natural gas in the industrial and commercial markets at prices unfairly designed to displace competitive fuels. Sound principles of conservation of a dwindling natural resource should govern the authorization and operation of natural gas transmission and distribution systems."

- **Energy consumption in the United States**

In the past 10 years natural gas made a major invasion of the coal market, but that cannot continue in conjunction with the climbing natural gas prices. A decade ago the United States consumed 33,000 trillion Btu of energy from natural gas, natural gas liquids, crude petroleum and products, coal and water power. Natural gas supplied 15 per cent of that total while coal furnished 44 per cent of the energy. Now natural gas supplies 25 per cent of the nation's energy requirements totaling 42,000 trillion Btu and coal has declined to 28 per cent of the total energy.

The talent of Americans for putting natural resources to work for them is shown by the startling statistics that in 1920 the total energy consumed per capita in the United States was 186 million Btu and today it totals 246 million Btu.

- **Gas versus coal**

The quantity of natural gas used for boiler fuel in the United States is substantial. Most of that gas competes with coal, although fuel oil is also seeking the same market. In 1957, excluding field use, 8.8 trillion cu ft of natural gas were consumed in the United States. Of that amount 3.3 trillion cu ft or 37 per cent was utilized by residential and commercial customers, 4.2 trillion cu ft or 48 per cent was used by industrial customers, and 1.3 trillion cu ft or 15 per cent was used as boiler fuel for steam electric generation.

The future battle between coal and gas to supply the thermal energy needs of the electric utility industry was brilliantly described by Francis Adams, chief of FPC power bureau, in a current address to a coal association. That expert declared: ". . . the electric power industry has within the brief period of 10 years become your number one customer, having taken over that distinction from the railroads. Since 1947 the use of bituminous coal for power production has increased nearly 100 per cent to a total of 157 million tons in 1957. During this same period the use by railroads has declined from 109 million tons to only 8 million. To put it another way the increasing market for coal in the power industry has already provided virtually full replacement of the loss of the railroad market, and I believe I can show you that the prospect for future growth of the power industry market is indeed a bright one." * * *

"At the beginning of this year electric utility systems had a total installed generating capacity of 129 million kilowatts. Of this amount, 21 per cent was hydroelectric, 77 per cent steam-electric and 2 per cent internal combustion. Total utility generation in 1957 was 631 billion kilowatt-hours. To complete the picture we should include the 85 billion kilowatt-hours generated by industrial plants giving a grand total of 716 billion kilowatt-hours."

* * *

"Our latest long-term forecast was published in April of 1958. In this report, national power requirements of electric utility systems were estimated to be nearly

1900 billion kilowatt-hours in the year 1980, a figure some three times our present requirements."

* * *

"Current estimates of the Bureau of the Census show a United States population of 244 million in 1980." * * *

"I doubt if many economic experts anticipated back in 1949 an expansion in steel capacity of nearly 40 million tons in the 8-year period 1949 to 1957. Nor did they anticipate that by 1956 aluminum production would amount to nearly 1.7 million tons in comparison with the 1949 production of 600,000 tons. And obviously they could not foretell that atomic energy plants built for the production of fissionable material would in 1957 be using 60 billion kilowatt-hours of electric power. Not only has industrial capacity expanded tremendously in the last 10 years but also use of electricity per unit of output has been increasing. This has enabled industrial power consumption to hold its position of about 50 per cent of the total kilowatt-hours sold by electric utilities, notwithstanding the great increase in the use of electricity in the nation's homes and commercial establishments.

"In addition to the 290 billion kilowatt-hours which industry purchased from electric utility systems in 1957, it also generated a substantial amount of power—85 billion kilowatt-hours—in its own plants. A very large part of this was generated by paper plants, primary metal factories, and the chemical industry, but several thousand industries generate at least a portion of their own requirements, and in most cases this is done where heat or steam needed in the industrial process can also be utilized in the production of electric energy."

* * *

"The fast growing electric space heating load can have a tremendous effect on the nation's total power requirements. Difference of opinion as to how fast electric heating will expand is one of the major factors contributing to the differences between load forecasts of the Federal Power Commission and certain other organizations. Electric space heating has enormous possibilities and there are some areas of the country where nearly all new homes are being equipped with electric heat. If we should ever get to the point where all the homes of the country are electrically heated, this load in itself might be bigger than the total electric utility load of today for all purposes including industrial and commercial. Therefore, it is a very important consideration in load forecasting work. As far as the coal industry is concerned, electric heating will no doubt be welcome since for every Btu of electric heat that is consumed in the home a larger number of Btu's of coal has to be consumed in utility system generating plants in order to produce the electric Btu. Thus, your industry should not be alarmed if a home decides to discard its coal-burning furnace and install electric heating equipment." * * *

"However, the gas industry is not standing idly by. They seem to be doing a good job of promoting gas heating in homes, as the coal industry well knows. The gas industry is also actively engaged in research on an improved gas air conditioning cycle which is meeting with some success. As the competitive situation between the gas and electric industries develops further, we will be in a better position to judge the results. Meanwhile, we will hold to our estimate of 2 trillion kilowatt-hours as the total power requirements of the nation's electric utility industry in 1980."

* * *

"The coal industry has made great progress during the past decade in its battle with post World War II inflation. Mine modernization and electrification, strip-mine operations, and auger mining have combined to double your over-all coal production rate from 5 to 10 tons per man-day. The result is, according to Bureau of Labor Statistics reports, that the average value of all bituminous coal at the mines was $5.10 per ton in 1957 as compared to $3.44 in 1946, an increase of only 67 per cent. This compares most favorably with an increase of 116 per cent in the average hourly wage rates paid in the bituminous coal industry. Your industry is to be complimented on this fine record, which at the same time includes improved working conditions, medical care, etc.

"I am sure we can all agree that you gentlemen, the coal producers, do not enjoy a monopoly in the progress made against inflation. Electric power engineers have also done an outstanding job in this respect. Through increased efficiencies, the average total cost of thermal power production is now about 7.50 mills per kilowatt-hour of which 3.0 mills, or 40 per cent, is for fuel. The increased efficiencies have been accomplished primarily by raising plant operating temperatures and pressures." * * *

"Fuel transportation costs have been a problem for most utilities as well as the fuel producers. According to the August 1957 issue of *Transport Economics*, an Interstate Commerce Commission publication, rail freight rates increased approximately 108 per cent during the 11-year period 1946 to 1957. Fuel producers and consumers are endeavoring to hold down transportation costs. For example, we have a few large mine-mouth power plants from which high voltage transmission lines, in effect, carry the fuel via wire to the power market. Unquestionably there will be more of these plants. We are all following with much interest the 100-mile long coal pipeline in eastern Ohio, which is now in commercial operation and carrying over a million tons per year to a large generating plant in Cleveland. There are also short belt conveyor systems for coal hauls of about five miles, and it is conceivable that by 1980 we could have very long belt conveyor systems." * * *

"After deducting from the total power supply needed in 1980 the power estimated to be available from hydroelectric, nuclear, and internal combustion plants, we find that steam-electric plants will have to provide about 300 million kilowatts in the year 1980 and will have to produce about 1.4 trillion kilowatt-hours annually.

"The staff of the Federal Power Commission has made considerable study of the trends in the use of the several conventional fuels in the generation of electric power. I

Continued on page 86

FLAME SET* SELLING POINTS
are closing this range sale!

1. "Yes, madam, this gas range has the 'burner with a brain'—two, in fact! Every pot you own becomes an *automatic* temperature-controlled utensil.

2. "You dial the desired temperature and the gas flame *automatically* raises and lowers, cooking the food at that temperature setting.

3. "And this 'burner with a brain' has the new FLAME SET feature. Now you can adjust the flame size simply and easily . . . small pan—small flame. BIG pan—BIG flame.

4. "And in non-aluminum utensils, perfect frying and food warming calls for a *moderate flame* . . . a high flame causes hot spots. Using the FLAME SET feature, you can dial that moderate flame . . . the temperature-controlled heat *spreads evenly*—no scorching. This flame adjustment isn't possible with the old 'burner with a brain.'

5. "This new gas range frees you of pot watching drudgery—gives you time to do more creative things for your family."

*TRADE MARK

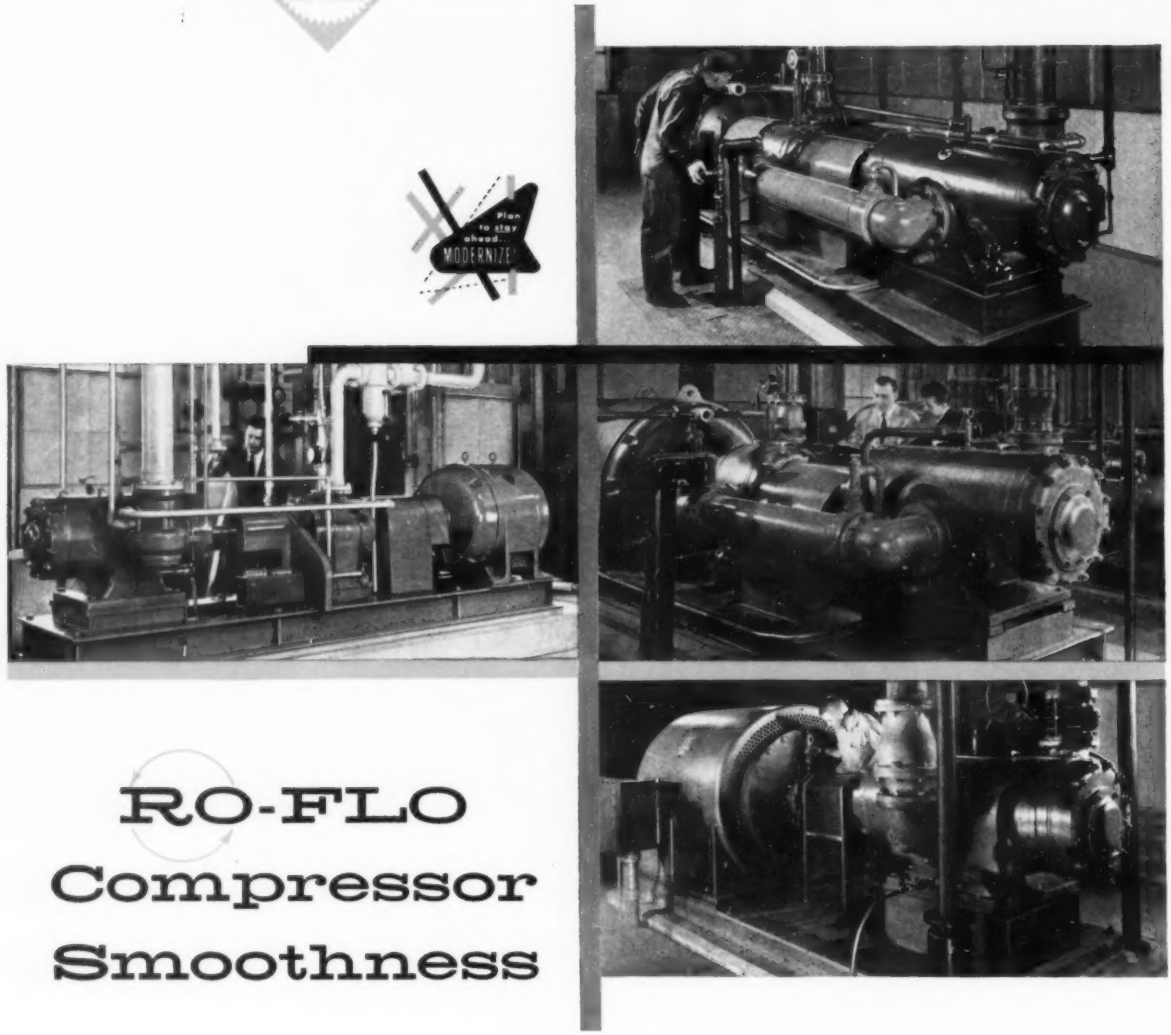
FLAME SET—another advance for the gas industry through Robertshaw's investment of earnings into research and development. Robertshaw Thermostat Division, Robertshaw-Fulton Controls Company, Youngwood, Pennsylvania.

VMA 6360-B

Robertshaw

MR. CONTROLS

for modern gas service



RO-FLO Compressor Smoothness

...for peak shaving

Ro-Flo compressors are widely used for peak shaving operations. Some of the reasons for this acceptance of Allis-Chalmers rotary compressors are:

- Grouting requirements are small, because *Ro-Flo* compressors are rotating units with practically no vibration.
- Units are compact — fit in small floor space.
- There is minimum exposure of moving parts for operator safety.
- Controls are simple and easy to reach.
- Construction is package type . . . easy to install.
- They are easy to adapt to gas engines, steam turbines or motor drives.

Not shown is the maintenance simplicity inherent in the design.

A wide range of sizes is available to fit any need. For details on Allis-Chalmers compressors, as well as motors, control and other components for peak shaving, *contact your nearby A-C office or Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.*

Ro-Flo is an Allis-Chalmers trademark.

A-1030

ALLIS-CHALMERS

TECHNICAL TRENDS

By GUY CORFIELD

Super-performance heat insulation

There is currently great activity in development of ultra-low temperature insulation, spurred by the use of rocket propellants such as liquid hydrogen and oxygen, and by the increasing interest in liquefied natural gas. The evaluating factors are minimum heat transmission in Btu per unit of thickness, time, area, temperature difference and density, the latter particularly important for airborne use.

Linde has developed a series of super-insulating materials which are claimed to be some 27 times more efficient than standard vacuum insulations. No details have been revealed, but claims are made that a 26,000-gal. tank of liquid hydrogen at —440 deg. F would lose only 9 per cent of its contents per year if insulated with these materials.

National Research Corp. has announced a development "about 15 times better than the commonly used vacuum-powder insulations on all counts, and twice as good on a performance to density basis than any insulation reported to date." NRC also has not revealed any details, but it is expected that their development incorporates high vacuum (which controls heat transfer through conduction and convection) with some kind of specially sized and shaped and dispersed filler material to break up transfer by radiation between the walls of the evacuated space.

The problem of finding out where we have been

Several years ago it was stated in this column that what we need is facilities for research to find out what has gone on or is going on in research. One of the most difficult and yet the most important and productive phases of a research project is to find out what has already been done on the problem or related problems.

The situation is becoming progressively more frustrating. At a recent week-long International Conference of Scientific Information, 900 literature documenters met to discuss the storing and retrieving of scientific information. It was brought out that data derived from research have already reached avalanche proportions, and is expected to double in volume every 10 years. However, even though such data are vital to scientific and technical progress, it is often easier to do the research work over again than to try to find out what has already been done. It was estimated that $200 million per year could be saved by industry if research information services could be made effective.

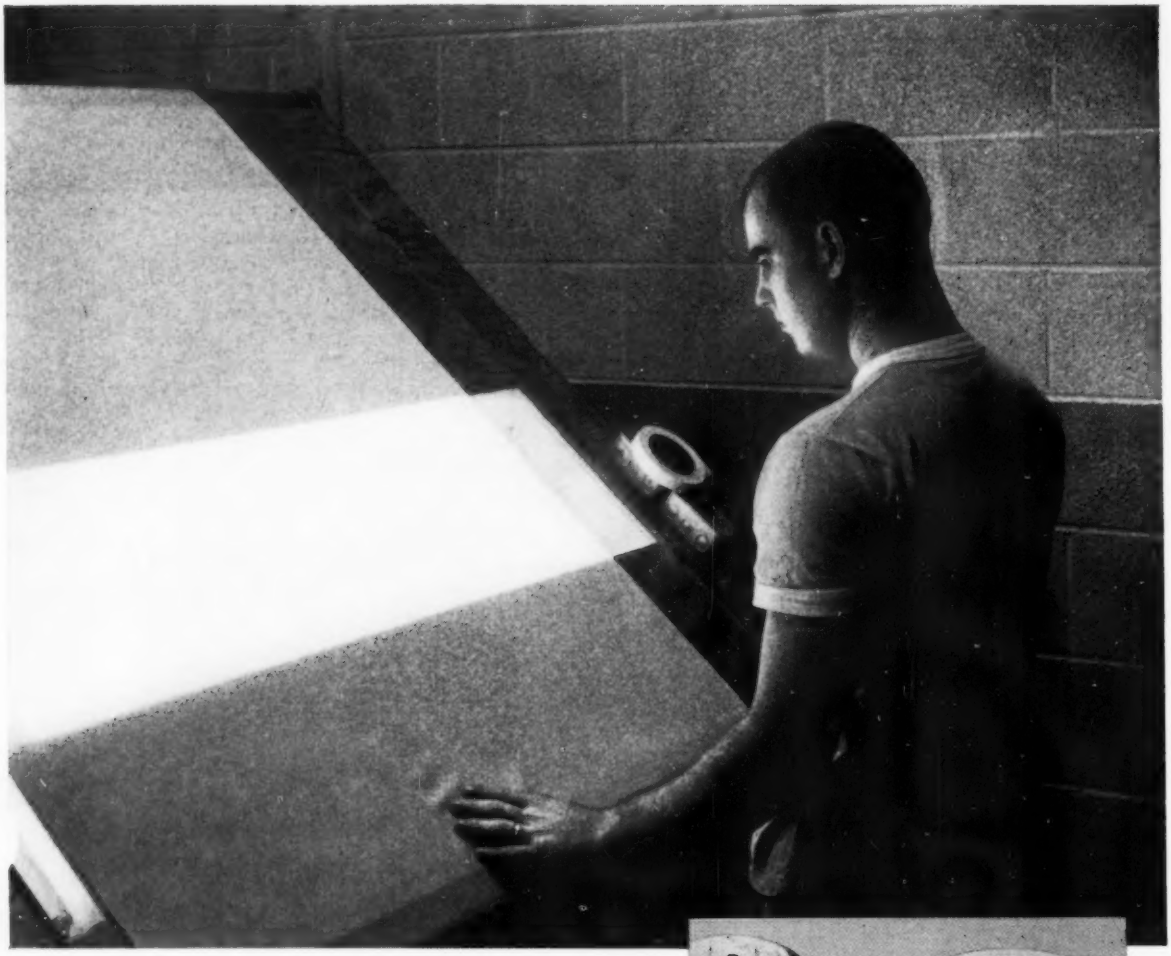
No solution was indicated, even with the presently available electronic storage and retrieval systems and mechanisms. There are apparently many other problems beyond those of a mechanical nature. What are the overall objectives? Who needs what information? What for? How can it be best gathered together? Where should it be stored? How can the gathering and storing and retrieving be financed? There is even a legal problem arising from copyright laws, i.e., is it legal to store, and reproduce, for another's use, in whole or part or re-write, data that have been published under copyright restrictions?

Foams for structural and insulating purposes

In the search for light-weight structural shapes and insulators, considerable attention has been given to cellular or foamed materials. General Electric has announced a process for foaming nickel, copper and iron. The metal is powdered and mixed with an organic resin and a foaming agent that releases carbon dioxide or nitrogen gas. When baked in an oven the gas is released to form a cellular structure with physical properties dependent on the proportions in the mixture. The result is a light rigid foam which has interconnecting cells and is porous enough to transmit air or gases. The material can be molded into any form during baking, or can be shaped with conventional tools. A nickel foam, for instance, can have a specific gravity from 1 to 4, compared to 9 for solid nickel. The strength of the foam is proportional to its density. It can be used for high-temperature filtration, or for insulation or filler material that can be cooled because of its porous structure.

Another development, by Pittsburgh Corning Corp., is 99 per cent pure fused foamed silica. It is a light-weight foam with non-interconnected bubbles. It is produced by boiling at 3100 deg. F, with a carbon foaming agent, in an electric furnace. It is advocated as a substitute for acid brick insulation. One-inch thickness is said to be equal in insulating value to 18 in. of brick, and its density is 10-15 lb per cu ft as compared to 140 lb for acid brick. It will resist 2200 deg. F temperature indefinitely and, because of its sealed cell structure, will not absorb liquids or gases. Other uses are visualized, where high temperature resistance, light-weight and non-absorptiveness are important.

Still another foam has been developed by Allied Chemical Corp. It is an isocyanate-base polymer. It is produced as a liquid that can be flowed between two panels of wood, metal or plastic. Within a few minutes it will foam and expand to fill the entire space, and in 24 hours or less will set to a hard, rigid cellular structure. All this is accomplished without external heat or curing agents. This foam is said to have excellent heat-insulating and sound-deadening qualities. In addition to this sandwich type of insulation, it can also be molded into any shape, or sprayed on to structures to provide either a rigid or resilient insulating foam coating.



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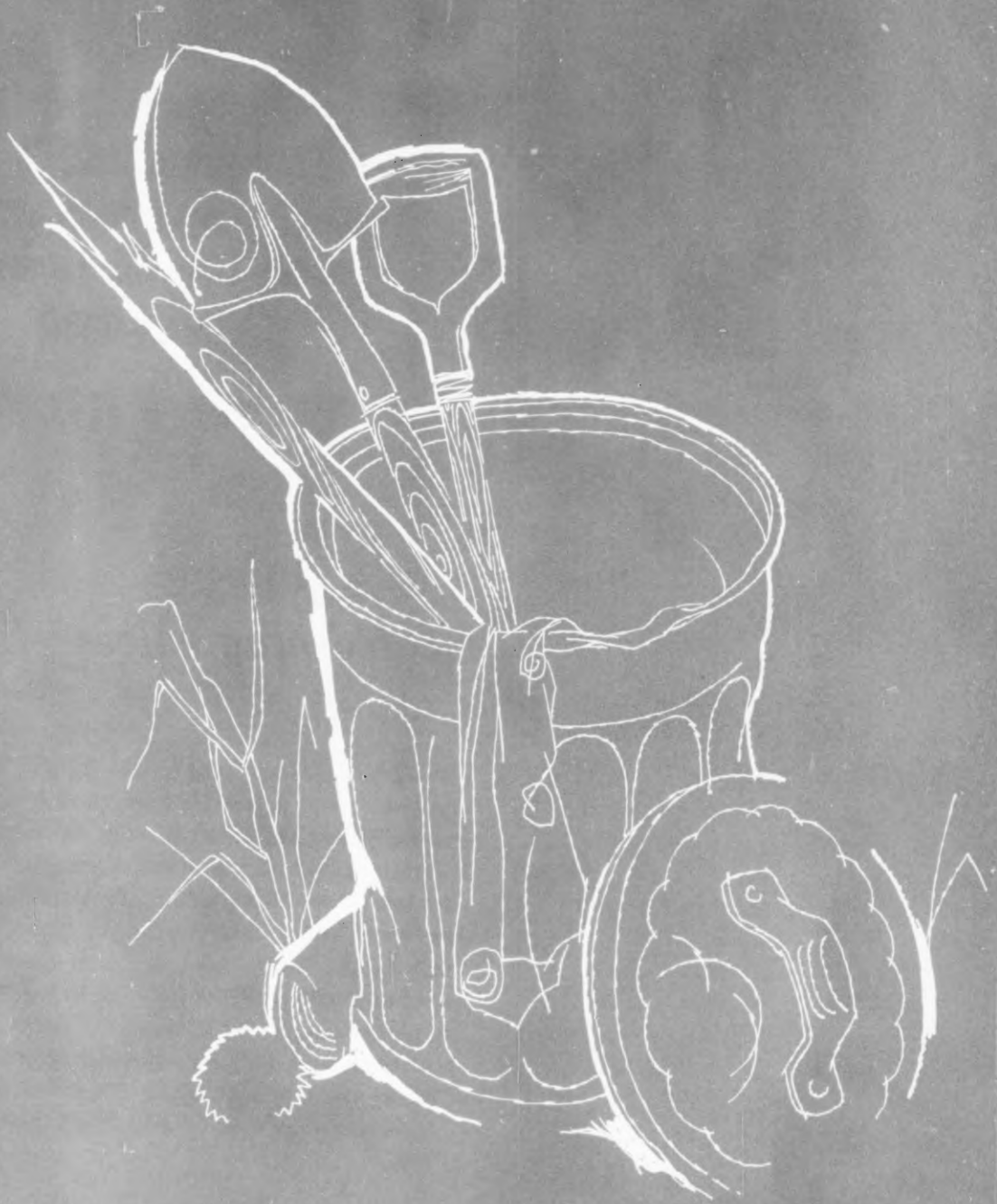
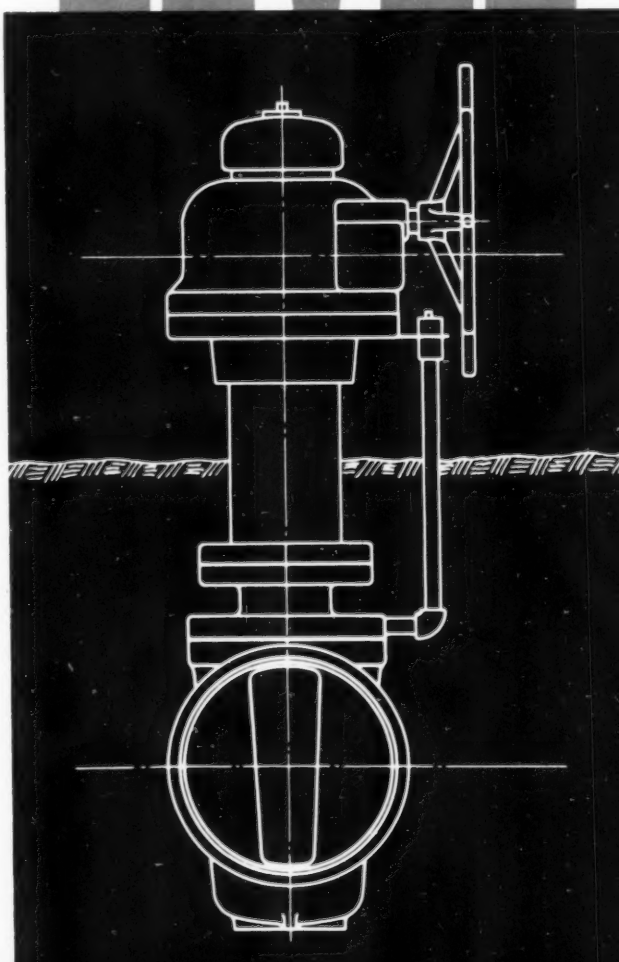


Plug, lubrication, and packing adjustments are all TOP LEVEL operations when its a Walworth LPV with extended stem.

That's right! you can junk your shovel now because of

TOP LEVEL



When you install a lubricated plug valve in buried service be sure it's a WALWORTH with extended stem.

You can install a Walworth LPV, with extended stem, below grade. And you can adjust it smoothly and easily from above ground. Lubrication and packing adjustments are TOP LEVEL operations, too. To adjust and maintain other lubricated plug valves you have to dig deep, and get underneath them. When you bury a Walworth LPV—with extended stem—you can toss your shovel away — and *cut maintenance costs.*

ADJUSTMENT

on WALWORTH lubricated plug valves

All adjustments and ALL maintenance of Walworth extended stem LPV's are done above grade. To insure a tight valve you must be certain the plug is properly seated at all times. A plug that's too loose requires excessive lubrication to prevent leakage. One that's too tight takes too much work to operate. *All* buried valves are subject to changes of temperature and line strains which affect their operation. But, Walworth Lubricated Plug Valves *can be adjusted in the field*, with small tools—*at top level.*

All Walworth Lubricated Plug Valves give you fast, easy, tight closures. A quarter turn opens or closes a Walworth Lubricated Plug Valve. It combines easy operation with tight closure because it's lubricant-sealed. And it can be serviced under pressure. In Walworth LPV's the lubricant well is at the bottom of the valve. When fully lubricated and properly adjusted, the Walworth LPV operates more easily than any other type of rotary action sealed valve.

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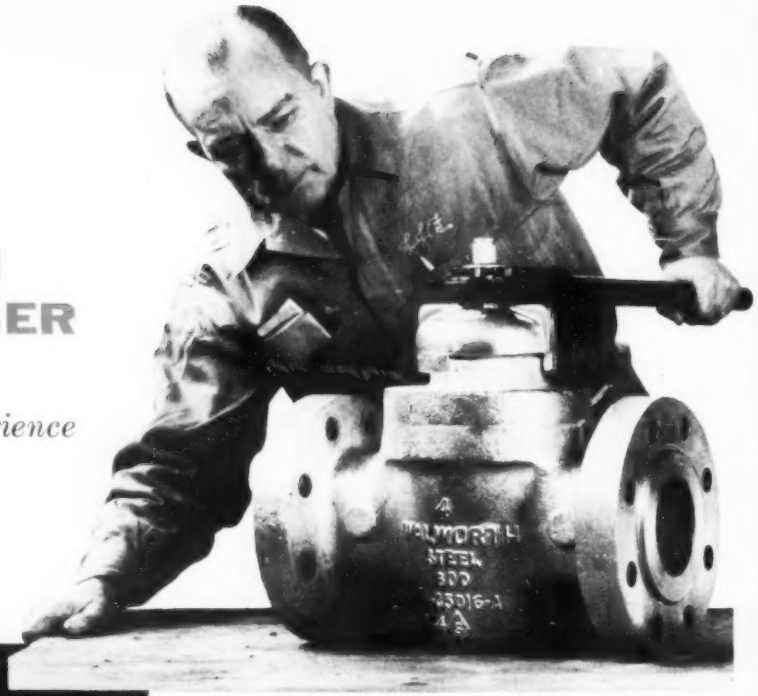
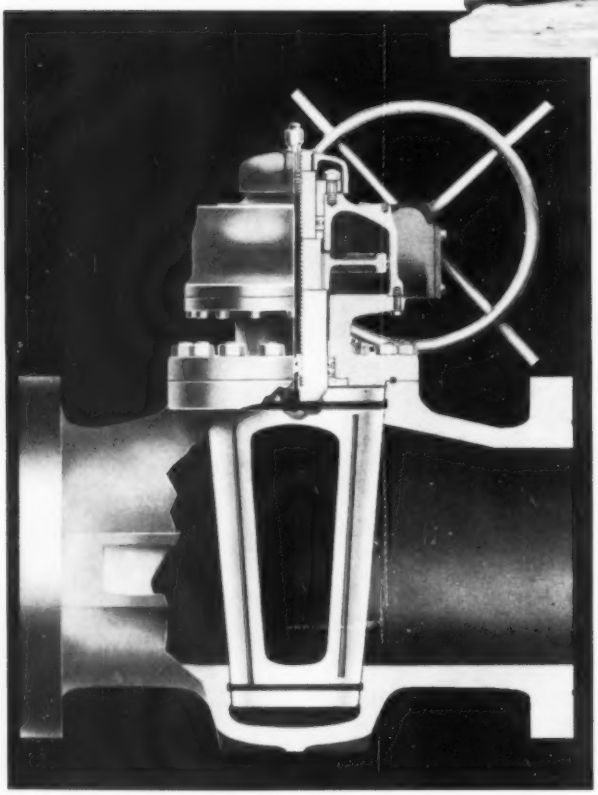
THE WALWORTH CUSTOMER

brings a wealth of valve operating experience to bear when he selects an LPV.





Here are 6 characteristics that make THE WALWORTH CUSTOMER choose the WALWORTH LUBRICATED PLUG VALVE

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2. Groove, cut part way up side of lubricating fitting lets operator note any tendency of lubricant to extrude, *before* fitting is entirely removed.
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4. Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.
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WASHINGTON

BY NEIL REGEIMBAL
GAS Washington Bureau

Phillips case re-enters orbit

THE gas industry's whiskered infant, the Phillips case, is starting this month what in the space age can best be described as its second revolution in orbit.

The case — whiskered by the 11 years it's kicked around legal Washington and the courts; an infant because it will still be the first progeny of federal gas producer regulation—will head for its second trip to the Federal Power Commission sometime after June 26. This is the date when the extension for filing exceptions to a hearing examiner's ruling in the case runs out.

The case bears another striking resemblence to the horrible, fatal monster missiles that right now are putting artificial satellites into orbit but are designed primarily to transport fantastic nuclear death at hypersonic speeds. Only once since the case originally started in 1948 has the gas producer won a victory. Thas was a short-lived win when the FPC ruled it did not have jurisdiction—a ruling many times upset by the courts now.

For gas distributors, the latest explosion in the Phillips case—the examiner's ruling upholding utility-type regulation of independent producers—will produce mixed results if upheld by the FPC and the courts later. For some, it may mean lower prices for gas. For others, it will probably mean higher prices.

But in the long run, the effect will probably be injurious for the same reasons that led many distributors to support the now-dead Harris natural gas legislation.

In brief, the examiner, veteran FPC employee Joseph Zwirdling, ruled that:

* Producers should be allowed a 9.25 per cent rate of return, but they cannot take advantage of depletion allowances in computing costs, only actual tax liabilities.

* Rates will be based on cost of service, computed on a system-wide basis rather than on a producing area. The utility-type formula for arriving at this cost permits reasonable allocation of determining the relative costs of joint gas-oil production.

The effects of the complicated ruling are broad. For one thing, if upheld it will tend to raise prices at the low side of the 11.6 cents per Mcf granted Phillips, and lower those that are above this. The average producer price has been figured now at about 12 cents per Mcf, but they run from just over 1 cent to over 23 cents.

The long range effects of the decision handed down by Zwerdling are still being discussed by the lawyers in Washington who argue the gas cases before the FPC and the courts.

The case is the first major cost-of-service producer rate case to go to the commission for a decision.

But they privately tentatively agree that the utility-type rate regulation formulated by the examiner will have to be complimented by another basic decision before the full scope of FPC regulatory policies to cover both large and small independent producers can be set.

They fear that if the system laid down by Examiner Zwerdling is applied to small producers it will on the strictly cost basis give them rates of only 2 to 4 cents, and in effect put them out of business.

Some gas industry experts are hoping that the FPC will overturn the examiner on methods of arriving at costs, and lift the price freeze by agreeing to determine cost-of-service on an industrywide basis for each area, rather than on a systemwide basis.

The current so-called omnibus case, in which the FPC launched its own probe of natural gas field prices, may give the answer to how the Phillips ruling can be modified to apply to smaller producers.

Eaxminer Zwerdling has little sympathy for the pleas of the gas producers—expressed over and over again in the Harris series of natural gas bills—that any federal control of producer prices should be on a "commodity value" rather than cost-of-service basis.

He rejects arguments that utility-type regulation is either unduly complicated or unworkable for independent gas producers.

He claims the only problem originally was for the FPC to select from several alternative proposals a method of allocating joint costs between oil and gas. Once this selection is made, he believes, regulation can be applied without too much trouble to all independent producers.

At least one member of the FPC, Commission Chairman Jerome Kuykendall, has indicated that he still wants flexibility in fixing producer rates. Utility-type rate base methods may be needed in some cases, he has said publicly. But he still agrees with the commission's original contention to Congress that it should be permitted to consider any and all elements and not calculate a cost rate base in every case.

Under existing court rulings, costs must be considered in every case. This problem, along with the question of how the FPC can set rates in initial contracts for delivery by a producer, may be cleared up a little as the Zwerdling decision in the Phillips case progresses through the courts. Or it may

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DEPENDABILITY

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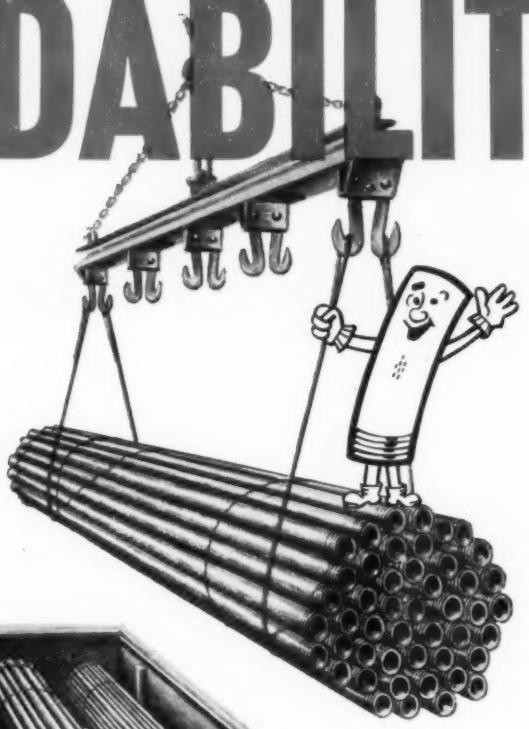

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CORROSION PREVENTION

DISTRIBUTION
TRANSMISSION

By MARSHALL E. PARKER

When to plan cathodic protection

WHEN should the planning start for a cathodic protection system? The answer, if the piping under consideration is an existing system, is—"immediately!" If, on the other hand, it is a planned line or system, the answer is—"immediately!" Both answers can be justified.

In the case of an existing system, the first step in the planning is actually a determination of whether or not cathodic protection is needed. A whole host of factors enter into this decision—the projected useful life of the line, the earnings and tax position of the company, the corrosiveness of the environment, the availability of men and equipment, the comparative position of other lines, and many others. However, even if the decision is that the line does not need protection *now*, but probably will later, then there are some things which should be done now. All company personnel involved should be put on notice that it is to be protected, and, as opportunities arise, needed steps should be taken. Whenever there is a shutdown, insulating material should be installed at needed locations. Test leads may be installed. Particularly if the structure in question is a town distribution system, a program of insulating at services should be instituted. Normally such a program will achieve almost complete isolation in a period of about five years, just by insulating every time a meter or regulator is changed out or tested.

If the decision is that the line is to be protected at an earlier date, then there are tests and surveys to be scheduled, arrangements to be made with operating and maintenance personnel, insulation to be installed or, if already in, to be tested, test leads to be installed, and other details to be attended to. Intermediate decisions call for various modifications of these arrangements.

When the line or system in question is one which is itself still in the planning stage, then it is even more imperative that the planning for the corrosion control program be initiated immediately. There are far too many instances on record where thousands of dollars have been spent to overcome the undesirable effects of features which would not have been included, if sound corrosion engineering opinion had been sought in the planning stages.

One instance comes readily to mind: a modern gas transmission system was built within the last three years. As far as can be determined, no one with any appreciable corrosion experience was on the planning or construction staff. From some unknown source, someone in authority came upon the idea that it is wise to insulate on either side of a river crossing. Consequently, pairs of insulated flanges were installed in each of the lines making up the system—lines varying from 14 in. to 30 in. in size—on each side of all river crossings. No test leads were provided, and *no record of the existence of these joints was available* to the corrosion engineer who was hired, long after construction was completed. The reader may guess the chaos which accompanied the first attempt to conduct current requirement tests, and the embarrassment to the corrosion engineer. The time lost was expensive, as was the labor and equipment needed to dig down to the joints for the proper installation of leads for necessary bonding.

Another instance, still more flagrant, concerns a newly organized company building its first line. For reasons which can only be guessed, the contractor was instructed by the owner to install a solid 4/0 copper bond, uncoated, without surface leads or even markings, to each and every line which was crossed during construction! Needless to say, when this becomes known, there was a very considerable amount of activity in the digging up and removing of bonds.

But prior planning for the cathodic protection of projected lines does not consist solely of the avoidance of ridiculous mistakes. It also involves the specification of coatings which will be consistent, in costs and excellence, with the cathodic protection program, to yield a complete corrosion control program which is adequate but not too expensive. It involves the specification of an adequate number of properly positioned test leads, both for test purposes and for needed bonds. It involves the specification and installation of insulated joints at the right places, and the accurate recording of these and other relevant features of construction.

It also involves a good job of inspection during the construction phase. New companies should always have hired their corrosion engineer by the time construction starts, so that he can function as a part of the inspection program. In the early planning stages, the services of a competent consultant may and should be used; this same consultant can often help train, or even find and train, the permanent corrosion staff.

One little word of caution on early planning—don't try to carry your planning too far ahead. An instance comes to mind, where one of our most advanced gas transmission companies did just that. A

Continued on page 86

dramatic new
exclusive control-
ON
VERY HOT
NORMAL
WARM
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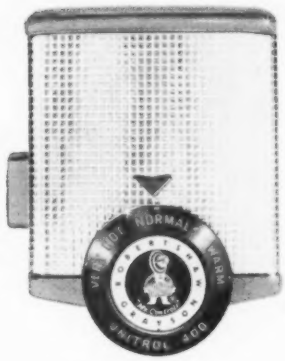

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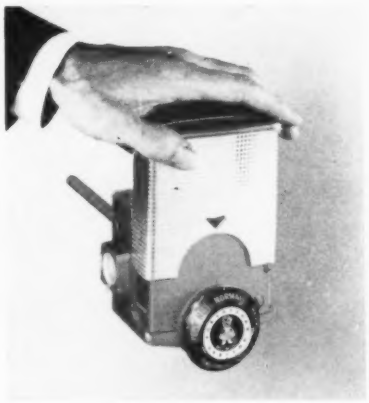
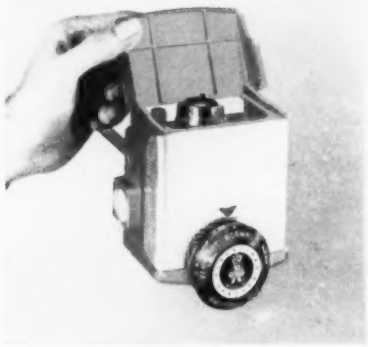


DEMONSTRATE the exclusive new slip-top cover!



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Equip your water heater with the control which will help sell it...the new Robertshaw Unitrol 400R! The lid flips up, and the whole cover slips off for easy pilot lighting. Here is a control your sales people can *demonstrate* to customers... here is a control which will enhance your water heater's ability, utility, recovery capability (the Robertshaw Unitrol 400R features a built-in pressure regulator) and reliability!

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use the compact MUELLER "T" Machine to connect services under pressure QUICKLY SAFELY SIMPLY

MUELLER NO-BLO Method

■ Make fast service connections by equipping your crew with a Mueller "T" Drilling Machine and H-17045 Completion Machine. Both of these machines are extremely light-weight and compact—ideal for use when many service connections must be made on a "mass production" basis!

Here is shown the few simple operations needed to quickly make an all-welded ¾" service connection to a steel distribution system with a No-Blo Service Tee.

"T" DRILLING MACHINE

- . . . drills holes from ⅛" to 1⅛".
- . . . inserts and extracts plugs in service tees, line stopper fittings and drilling nipples.
- . . . inserts and extracts stem and bushings in valve tees.
- . . . stops-off service tees and line stopper fittings.
- . . . for pressures to 125 p.s.i. at 100° F.
- . . . for temperatures to 250° F. at 100 p.s.i.
- . . . features ball-bearing thrust collar, "O" ring packing and simple knurled feed sleeve with thread-cleaning notches.
- . . . hand-operated.

H-17045 COMPLETION MACHINE

- . . . inserts and extracts plugs in service tees, line stopper fittings and drilling nipples.
- . . . inserts and extracts stem and bushings in valve tees.
- . . . for pressures to 125 p.s.i. at 100° F.
- . . . for temperatures to 250° F. at 100 p.s.i.
- . . . features "O" ring packing and simple crank handle.
- . . . hand-operated.

These machines are typical of the attention to detail in research, design and engineering that becomes a part of all Mueller No-Blo fittings and equipment produced for the gas industry.

1. WELD

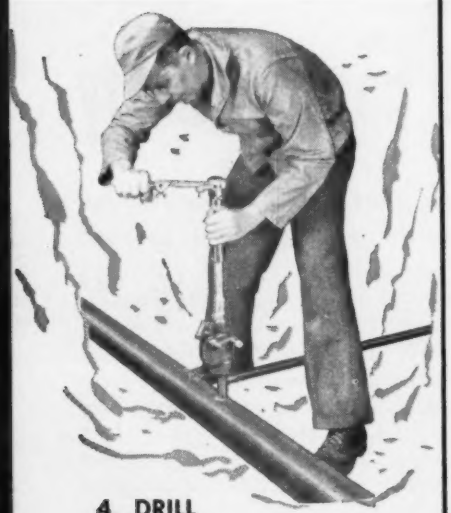
Remove cap and plug and weld tee to main. Weld service line to tee and complete line to curb or meter stop. Test weld with soapsuds and air pressure.

2. ATTACH

Attach control chamber to tee and open flop valve.

3. ASSEMBLE

Assemble proper drill to "T" machine and attach machine to control chamber.



4. DRILL

Drill hole into main.
Retract boring bar and close flop valve.
Remove "T" machine.

5. PLUG

Attach completion plug to shaft of H-17045 completion machine and attach machine to control chamber.
Open flop valve and screw plug firmly into tee.
Release plug from shaft of machine and remove machine and control chamber.

6. CAP

Screw completion cap solidly on tee and test for leakage.

NOTE: Future stop-offs of the service line at the main may be made at any time by inserting a rubber or steel shut-off tool into the tee with the "T" machine. However, if frequent shut-offs are to be made, we recommend installing No-Blo Valve Tees. These tees have a built-in valve that may be quickly operated with an ordinary screwdriver and wrench.

MUELLER CO. Since 1857 SERVING the Water and Gas Industries QUALITY

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada, Mueller, Limited, Sarnia, Ontario

GAS EQUIPMENT MANUFACTURERS GROUP GEM MEMBER

ARC-WELDING ATTACHES RISERS after acetylene torch has cut necessary tie-in holes.

"...X-TRU-COAT will save this city

THREE-INCH X-TRU-COAT CONNECTS OLIVE HILL system to main pipeline two miles away. Two-inch lines take off from this substation and run up tree lawns of the various streets.

READY FOR INSTALLATION, part of the 60,000 feet of one-, two- and three-inch X-TRU-COAT Plastic-Coated Steel Pipe and Tubing for Olive Hill is unloaded at railroad siding by crane.

Contractor Richard Short tells how plastic-coated pipe solved Olive Hill, Kentucky's soil problem

"Kentucky soil is death on ordinary pipe," says Mr. Richard Short, contractor who handled installation of a new, 60,000-foot natural gas system* at Olive Hill, Kentucky. "In our part of the state particularly, soil is extremely corrosive.

"It's my business to know the materials we use. We selected X-TRU-COAT because it's downright immune to the acids and chemicals that are our problem. The polyethylene coating on this pipe doesn't absorb water. It protects against electrolytic action, too. The metal is completely insulated by the plastic.

"Republic meant for that coating to stay on. We needed an ax or mattock to peel it off when tapping

FROM TREE LAWNS TO HOUSES, installation called for one-inch X-TRU-COAT with riser and right angle weld. Shut-off valves were attached before line entered residences.

thousands of dollars!"

in any place but at the ends of a length. Yet the same coating is really flexible. We never experienced damaged coating as a result of bending.

"This is the only pipe I know of that can do a job for Olive Hill," says Mr. Short. "By eliminating corroded service and distribution lines, X-TRU-COAT will save this city thousands of dollars!"

• • •

Learn more about the pipe that combines the strength of steel with the protection of high-density polyethylene plastic. Delivered ready for installation, X-TRU-COAT is available in a wide range of pipe and tubing wall thicknesses and diameters (through $5\frac{9}{16}$" O.D.). Get the complete story. Contact your local Republic sales office or mail the coupon.

**Distribution system designed by the firm of J. Steven Watkins, Consulting Engineers, Lexington, Kentucky.*

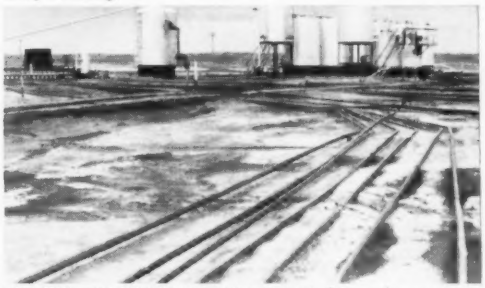
REPUBLIC STEEL

CLEVELAND 1, OHIO

World's Widest Range of Standard Steels and Steel Products

REPUBLIC SEMI-RIGID PLASTIC PIPE resists highly corrosive chemicals, prevents scale build-up, yet costs no more than ordinary pipe. SRK is easy to handle and install. Cuts with hand- or hacksaw. Joints are quickly and permanently "welded" with brush-applied solvent and plastic couplers. Send coupon for complete information.

FOR NEW AND REPLACEMENT USE—service entrance lines of Republic SRK are gaining wide acceptance. Corrosion-resistant SRK saves time and money in new connections through its low initial cost and ease of installation. On replacement jobs, SRK is threaded through existing line from tap to riser, eliminating costly trenching.



REPUBLIC CONTINUOUS BUTT WELD PIPE is known for excellent in-service dependability. Tight galvanized coating resists corrosion. Uniform ductility and strength assure easy workability, fine threading characteristics. Available in economical double-random lengths. Mail coupon for further information.

REPUBLIC STEEL CORPORATION
DEPT. GS-7476-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Send more information on:

☐ X-TRU-COAT Plastic-Coated Steel Pipe and Tubing
☐ Semi-Rigid Plastic Pipe ☐ Continuous Butt Weld Pipe

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

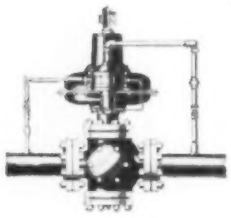
From your FISHER/MAN a silent sentinel

FISHER

THE MULTI-PURPOSE

This one all purpose regulator works for the protection and comfort of your customers on literally dozens of complex control jobs that now require several types of regulators used in combination. Not only does the Fisher Type 99 guard your customers' safety, but it simplifies the control installation for you. Initial costs are cut—maintenance on the line is minimized. The Fisher Type 99 multi-purpose pressure reducing gas regulator converts to high or low pressure pilots—minimum parts required. You can get additional information about the protective features, capacities and construction details of the Type 99 by writing Fisher for Bulletin P 99 C.

1. The factory pre-set spring provides powerful lock-off action.
2. Large, effective area of main diaphragm in combination with relay pilot assures trouble-free accuracy.
3. It is only a matter of minutes and a minimum of parts to convert to high or low pressure pilot.
4. 2" threaded or flanged inlet and outlet. Standard hi-tensile iron body for up to 150 PSI inlet, XH or bronze body for up to 400 PSI inlet.
5. Composition valve disc assures tight shutoff on zero flow and excellent regulation from low flow to maximum capacity.

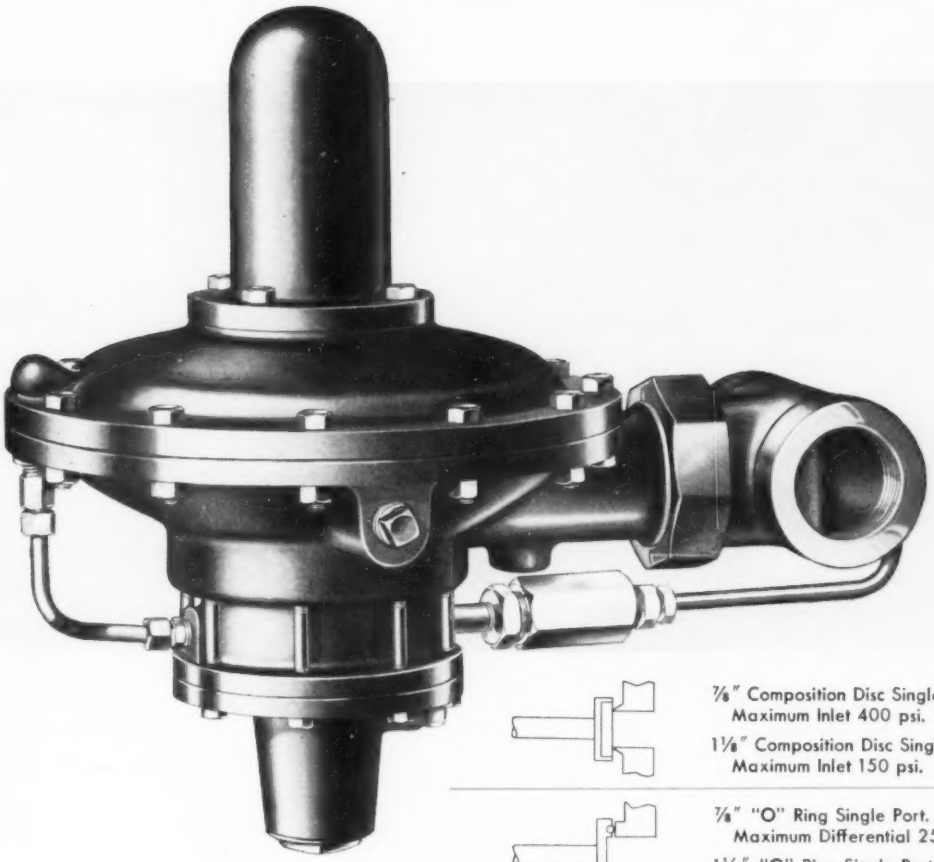


IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...CHANCES ARE IT'S CONTROLLED BY...

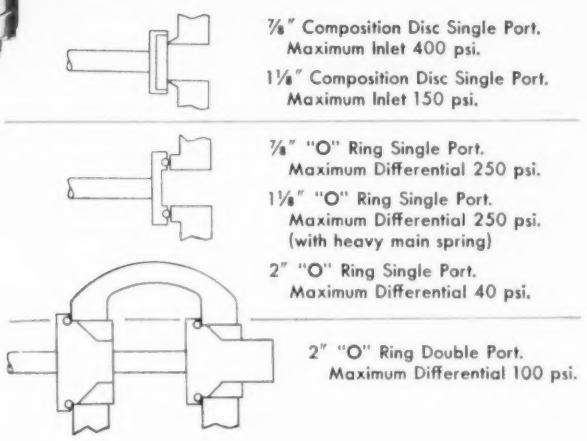
that guards your customers' comfort and safety

TYPE 99

PRESSURE REDUCING GAS REGULATOR



ORIFICE SIZES AND INNER VALVE STYLES SHOWN TO THE RIGHT



⅞" Composition Disc Single Port. Maximum Inlet 400 psi.

1⅛" Composition Disc Single Port. Maximum Inlet 150 psi.

⅞" "O" Ring Single Port. Maximum Differential 250 psi.

1⅛" "O" Ring Single Port. Maximum Differential 250 psi. (with heavy main spring)

2" "O" Ring Single Port. Maximum Differential 40 psi.

2" "O" Ring Double Port. Maximum Differential 100 psi.

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SINCE 1880

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

FISHER GOVERNOR COMPANY

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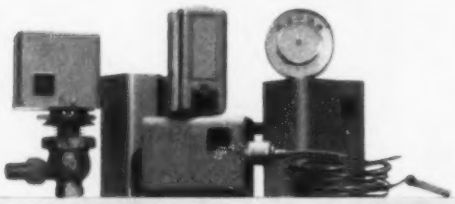
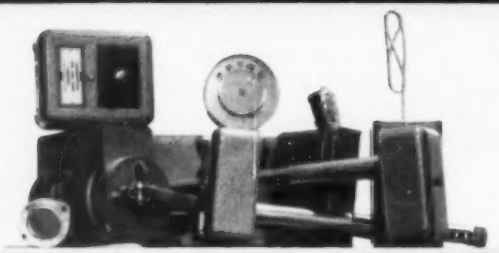
CONTINENTAL EQUIPMENT CO. DIVISION, Coraopolis, Pennsylvania

A COMPLETE LINE OF AUTOMATIC CONTROLS FOR DOMESTIC HEATING



RELIABILITY. *Outstanding service through the years proves one big fact: the General Controls line can handle the job. So service-free you can install it and forget it! For pressure controls, temperature controls, thermostats, combination immersion controls, motor valves and relays...you can count on Hydronic controls by General Controls.*

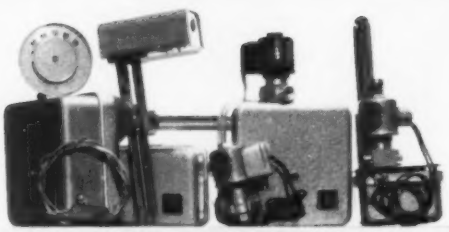
APPLICATION: Hydronics



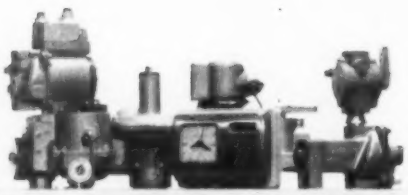
EFFICIENCY. *General Controls gives you fast, accurate control just the way you planned it and designed it. When the General Controls thermostat calls for heat...relays slip into place...valves open...the fan control turns on the fan at the exact right moment. Everything happens with the smooth, quick precision you expect from General Controls.*

APPLICATION: Warm Air

SAFETY... *is of first importance in the manufacture of all General Controls. When your system requires flame detectors, oil burner primary controls, combustion safety relays, oil burner valves...* ***know*** *you can depend on the precision, the quality, the safety of Oil Heat controls by General Controls.*



APPLICATION: Oil Heating



SELECTION. *You* ***name*** *the gas system... General Controls has the automatic control...or control system... for the job. It's the* ***complete*** *line of automatic valves, regulators, pilots, thermostats...line voltage, low voltage, millivoltage...for any type of natural, LP or manufactured gas.*

APPLICATION: Gas-Fired Heating

Your best source
for automatic controls...
General Controls. Precision-built
in six conveniently located plants.
Field service by specialists
out of 42 factory branch offices.
Send for complete ***Heating Controls Catalog*** today.

GENERAL CONTROLS

America's Finest Automatic Controls for Product or Process

Glendale, Calif. • Skokie, Ill. • Guelph, Ontario, Canada

Six Plants—42 factory branch offices serving the United States and Canada

7 TIMES LIGHTER

HANDLEY-BROWN CURB BOXES

Models with or without stationary rods.

PAT. APPLIED FOR

NON-CORRODING TOUGH and EASY-TO-FIND

Handley-Brown curb boxes are 7 times lighter than cast iron. Fabricated from a resin-rubber compound*, they are non-corroding. Built to last a lifetime. The easy-telescoping section prevents damage to service stop and piping.

They're easier to find, too. Permanent, built-in magnets with aluminum plates make these boxes easy to locate with either magnetic or electronic finders. Another plus feature . . . the high arch design of the base gives good clearance for curb stops, and allows ample room for foot piece.

Roadway Valve boxes* also available.

FOR COMPLETE INFORMATION MAIL COUPON

*A. B. S. Polymer

In Gas Service Equipment, H-B *engineering* makes the big difference...

End call-backs with attractive H-B outside meter boxes. Available as shown, or for recessed installation. Made of tough resin-rubber compound*.

Service Test Station. Provides a test station for leak surveys. Permanently installed. Makes random probing unnecessary. Made of tough resin-rubber compound*. Main test station also available.

H-B Cathodic Terminal Box. Landscape engineered, and non-corroding*. Leads are attached to the terminal block in the cap for easy testing.

Master Poly-Trol *automatic* gas shut-off valve. Shuts-off gas in event of overpressure, underpressure, excessive high temperature, and flooding. Serves also as a tamper-proof manual shut-off.

HANDLEY-BROWN CO.
BROOKLYN ROAD · JACKSON, MICHIGAN

"H-B engineering makes the big difference"

HANDLEY-BROWN CO., 2102 Brooklyn Rd., Jackson, Michigan

Gentlemen: ☐ I am interested in the Handley-Brown line of gas service equipment. Please send your complete catalog.

☐ Please have your representative phone for an appointment.

*Name*_____ *Title*_____

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The only chart drive that

During Hurricane "Flossy" all oil production on the Gulf Coast closed down because it was impossible to get out and wind the intermitters. A prototype of the newly announced Rockwell Gas Drive ran constantly through this emergency on a Pure Oil well, off the coast of Louisiana. A number of these drives have also been in successful service in the production regions of Wyoming and Canada operating through two cold weather seasons at temperatures down to −40° below zero. All in all, the new Rockwell Gas Drive has been rigorously field tested for over 2½ years.

Rockwell Gas Drive powers this typical transmitter

FEATURES

- **Powered by gas or air—no winding**
- **Built right into a standard Rockwell chart drive case**
- **Adapts to fit practically any instrument without cutting**
- **Uses only 4 cubic feet of gas in 24 hours**
- **Operating pressure range 15-25 psi**

withstood Hurricane "Flossy"

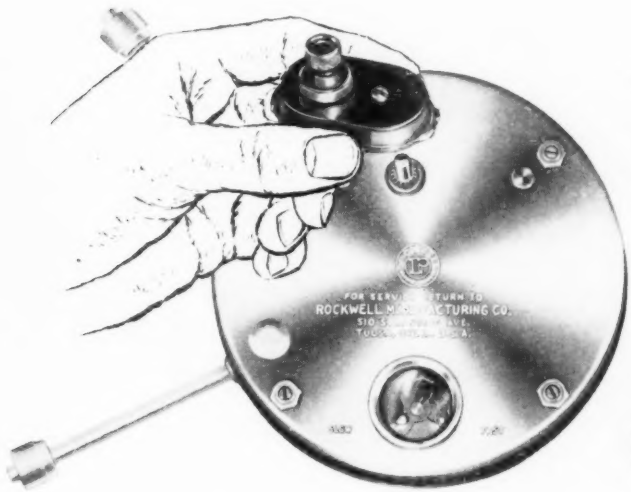
THE NEW ROCKWELL GAS DRIVE

A gas or air powered chart drive for all kinds of recording instruments—completely self-contained, self-starting.

Let's hope you will never need a chart drive that will run throughout a hurricane, but right now you can use the new Rockwell Gas Drive with profit to power remotely located instruments. You can forget the costly chore of periodic winding, for this drive is completely self-powered by the gas (or air) in the flowing stream.

The Rockwell Gas Drive is economical to run—it consumes only 4 cubic feet of gas every day. It's safe, too, for there is no venting problem. And it is built right into the case of a standard Rockwell chart drive and has all the interchangeability features of the spring wound design. It can be neatly fitted into practically any make intermitter, production timing instrument or recorder by using furnished adaptors for position and height. Speed changing turrets, which snap on to the main arbor, provide the utmost versatility in rotation rates. So with a stock of standard Rockwell Gas Drives, plus a selection of economical turrets, you can serve all your instrument needs.

Get full facts by writing Rockwell Manufacturing Company, Instruments Division, Pittsburgh 8, Pa.



The turret on top does the trick.

See how easy it is to convert a Rockwell Gas Drive to any of 10 different rotation rates.

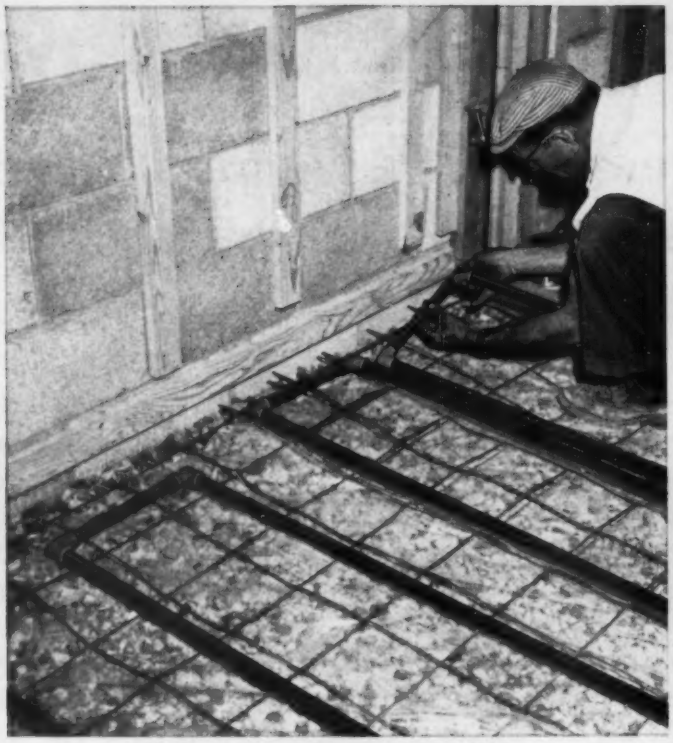
The main arbor on this drive rotates once every 24 hours. Speed changing turrets are available to give 2-hour, 3-hour, 4-hour, 6-hour, 12-hour, 48-hour, 72-hour, 7-day, and 8-day rotation. No special tools or skills are required to convert to different rotation rates; the turrets snap into place.

GAS DRIVES, CHART DRIVES

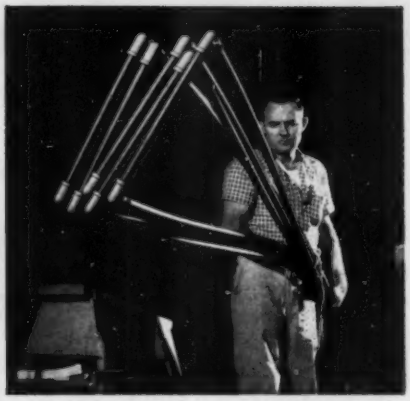
another fine product by

ROCKWELL

Naugatuck KRALASTIC®
Rubber-Resin



Installation of KRALASTIC pipe manufactured by Plastic Pipe Division, Triangle Conduit & Cable Co., Inc.



Whole sections are easily prefabricated and carried to site.

Solvent welding speeds and simplifies connections.

Now Kralastic reduces radiant heating costs

PROVED FOR 8 YEARS—1½ MILLION FEET IN USE

KRALASTIC®—the plastic pipe material that has proved so superior in dozens of piping applications—has now made it possible to reduce overall radiant heating costs by an average of 25% . . . as much as 25 cents a square foot!

Thoroughly approved by all who have worked with it, including architects, heating engineers, and contractors, KRALASTIC has made radiant heating practical for home buyers and builders everywhere by providing such advantages as these:

- Lower cost than any metallic coil material on the market
- Lightweight toughness that allows whole grid sections to be prefabricated in the shop
- Solvent welding for quick, sure joining on the job
- No need for special expansion joints as with other materials
- Exceptional resistance to clogging
- Complete freedom from rust and corrosion
- Compatibility with standard radiant heating designs and techniques

The more than 145 installations of KRALASTIC for radiant heating give evidence of the advantages you can expect in KRALASTIC pipe for potable water supplies, chemical piping, electrical conduit, waste disposal, applications by the hundreds. Learn first hand the proved advantages this tough rubber-resin material offers you. For further information on KRALASTIC pipe, for expert technical assistance with *any* product application, contact us today.

US RUBBER

United States Rubber

Naugatuck Chemical Division

614 K ELM STREET
NAUGATUCK, CONNECTICUT

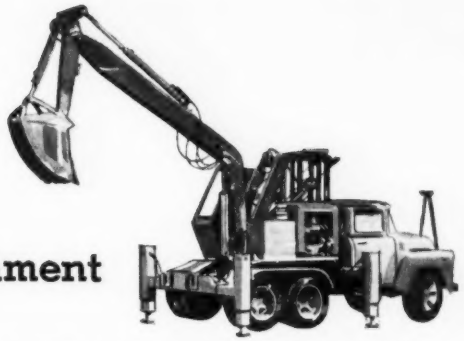
KRALASTIC RUBBER-RESINS • **MARVINOL** VINYLS • **VIBRIN** POLYESTERS

Akron · Boston · Gastonia · Chicago · Los Angeles · Memphis · New York · Phila. · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.

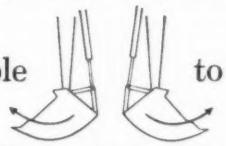
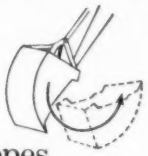
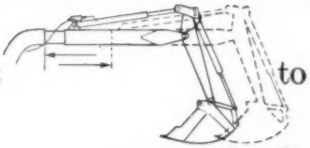
This is a

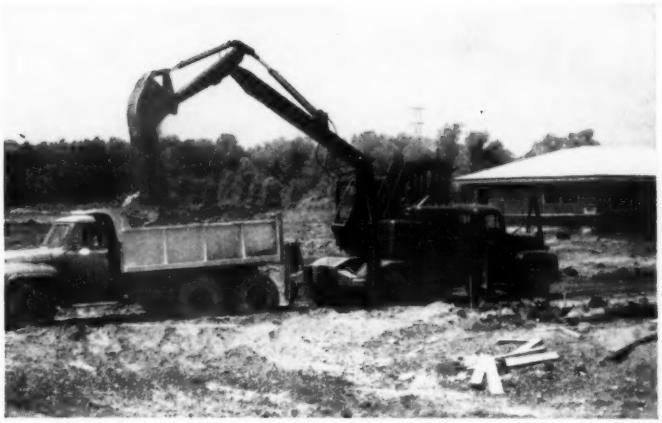
HYDROCRANE

...with a Hydrohoe attachment



and you can bet it's going to DIG because behind the teeth on that bucket is a combined total of 189,000 pounds of ram force! This machine has a combination of features that put it in a class by itself among half-yard hoes.

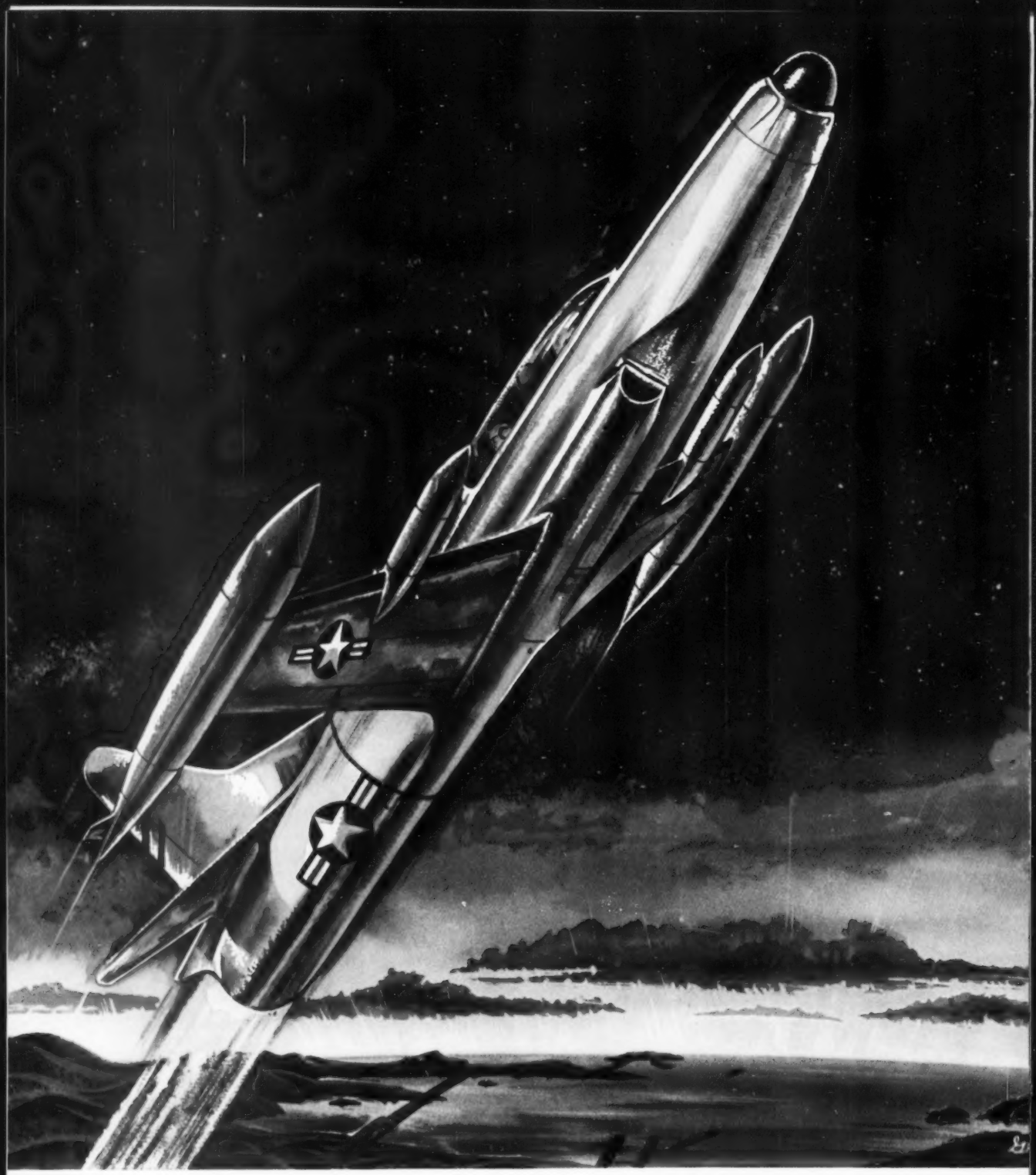
Here's why: The dippers for Hydrohoes, ranging from 24 to 60 inches wide, are reversible  to give you two-way digging action. Also, the dippers have hydraulic wrist action  to bite in fast and hard. The boom on this hoe telescopes 4 feet  to give you efficient dumping reach for every job, eliminating unnecessary move-up time.



Who uses them? Municipalities, counties, utility companies, excavating and sewer contractors. Your distributor is ready to show you how they'll work *on your jobs*. Call him today, or write Dept. 14H59B, Bucyrus-Erie Company, South Milwaukee, Wisconsin.

BUCYRUS ERIE®

Builds Better Equipment



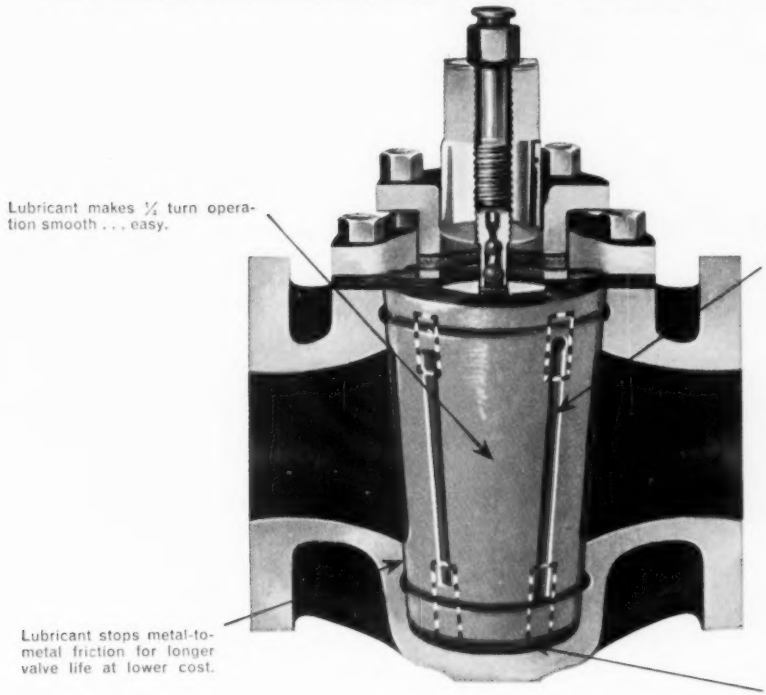
ROCKWELL- Nordstrom **VALVES**

How long would it fly without lubrication?

A sleek jet would be turned into a smoking, grotesque mass of junk *in seconds* without the proper lubrication to prevent metal-to-metal friction.

It's just common sense that wherever metal works against metal, lubrication is an investment in longer life, better performance. That's why Rockwell-Nordstrom *lubricated* plug valves stay in service longer at far lower cost than ordinary valves. But *pressurized lubrication* serves another very important function in these valves . . . it assures positively leak-proof flow control.

VALVE LUBRICATION MEANS DEPENDABILITY


Lubricant makes ¼ turn operation smooth . . . easy.
Pressurized lubricant in Sealdport* sealing grooves stops leakage of even lightest gases.
Lubricant stops metal-to-metal friction for longer valve life at lower cost.
Pressurized lubricant "cushions" plug for instant operation.

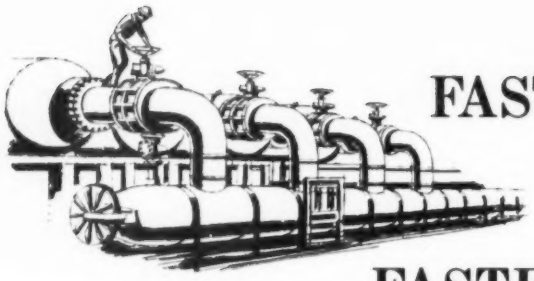
Rockwell-Nordstrom is the original and world's most complete line of lubricated plug valves with sizes from ¾" to 36" and pressures to 15,000 lb. Available at leading oil field and industrial supply houses everywhere. For details, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. If you live outside the U. S. A., write: Rockwell International Division, Pittsburgh 8, Pa.

ROCKWELL-Nordstrom VALVES

another fine product by

ROCKWELL

*Reg. T.M. Rockwell Manufacturing Company



FASTEST-GROWING FUEL in America's FASTEST-GROWING REGION

***El Paso Natural Gas Company** reports record deliveries of Natural Gas to customers in the West*

Natural gas is America's fastest-growing energy source, and El Paso Natural Gas Company and its subsidiaries serve natural gas's fastest-growing market.

Deliveries of gas were at record highs in 1958 as El Paso and subsidiaries continued to expand their pipeline systems and increase their gas reserves to meet the long-term energy demands of the West.

For the second consecutive year, gas deliveries totalled more than a trillion cubic feet.

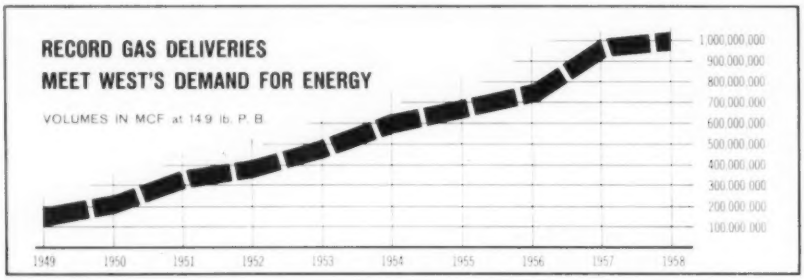
Extensive exploration and purchase programs brought total gas reserves at year's end to an all-time high of 38.8 trillion cubic feet—assuring vitally needed energy supplies for western consumers and industries in the years ahead.

El Paso's 1958 annual report, distributed to its 51,835 stockholders (an increase of 10 per cent in 1958) reports consolidated gross revenues for 1958 of $368,299,522, compared with 1957's $301,090,537. Net income was $35,308,813 in 1958, compared with $34,506,238 in 1957.

The report gives details of 1958's accomplishments, as well as plans to meet the future needs of western consumers—for natural gas, for petroleum, for petro-chemicals.

El Paso Natural Gas Company and its subsidiary, Pacific Northwest Pipeline Corporation, serve customers in California, West Texas, Arizona, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming and Colorado.

For copies of El Paso's 1958 Annual Report to Stockholders, write to El Paso Natural Gas Company, El Paso, Texas.



EL PASO NATURAL GAS COMPANY

Common Stock listed on the New York Stock Exchange, Midwest Stock Exchange and Pacific Coast Stock Exchange.

Registrars: *New York, City Bank Farmers Trust Company; Chicago, The First National Bank of Chicago.*

Transfer Agents: *New York, The Chase Manhattan Bank; Chicago, Continental Illinois National Bank and Trust Company of Chicago.*

FOR GAS MEN ONLY!

POWERS *American*

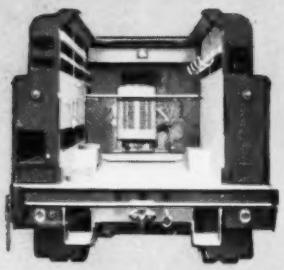
SERIES 850-C

Gas Line Construction and Maintenance Body

Looks like a streamlined warehouse on wheels doesn't it? And, why not—for that's what it is. The 850-C is designed to carry everything (including air) needed for any gas construction or maintenance job. That means plenty of room for hand and pneumatic tools, pipe and fittings, parts and welding equipment . . . name it, and there's a place to carry it in the Series 850-C.

There's plenty of room for a seven-man crew, too—four in the comfortable crew compartment that's part of the body, and three in the truck cab.

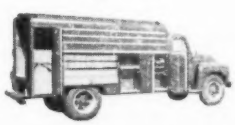
Bodies can be furnished in lengths ranging from 12'3" to 14'3" . . . or without crew compartment in 9' to 12'6" lengths . . . equipped specifically for your job.

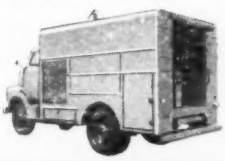


Air compressor . . . driven by truck engine through a power take-off, or gasoline-powered . . . can be supplied—with air receiver — in capacity desired.

Hose reels, holding 50 ft. of ¾" high pressure air hose, are installed in lower rear compartments . . . pay-out and take-up hose through openings at rear of body.

CUSTOM-MADE JUST FOR YOUR OPERATION, TOO! Powers-American Series 850-C Bodies, and other standard bodies in the line, can be modified to fit your requirements. Powers-American quality and workmanship is also available in tailor-made bodies . . . built to your specifications or designed by our engineers to meet your specific work needs. Shown here are a few of the hundreds of specially-designed bodies serving operating companies throughout the United States and in many foreign lands.





Descriptive Bulletin No. 206, complete with price information, is yours for the asking.

McCABE-POWERS BODY COMPANY

5900 NO. BROADWAY, ST. LOUIS 15, MO. | 625 CEDAR STREET, BERKELEY 10, CALIF. | 5525 S. E. 28TH AVE., PORTLAND 2, ORE.

100 YEARS FROM NOW...

. . . Many of our modern conveniences will be gone by the next century. But there is one thing you can count on: the cast iron pipe you install today will still be in good operating condition in 2059.

We can say this because of our records of longevity—records unchallenged in the gas field. Cast iron pipe laid over a century ago by 59 American gas utilities still remains in operation.

And today's cast iron pipe is even stronger than those rugged mains of yesteryear!

Tough, corrosion-resistant cast iron pipe withstands almost all soil conditions. Modern, bottle-tight mechanical joints resist washouts, vibrations and heavy top loads. And you can install cast iron in even the most congested areas because of the convenient lengths . . . no complicated jointing equipment required, either!

Dependable now . . . and for another hundred years!

..All good reasons for you to choose

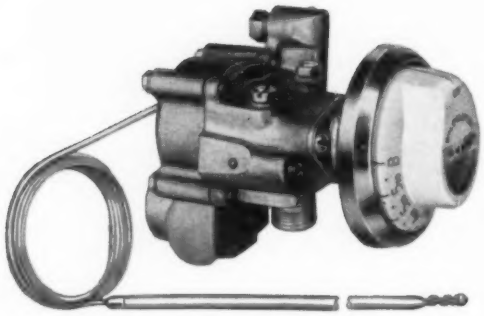
CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

Write for complete information to Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Ill.

NEW WILCOLATOR **MODEL X** CONTROL

electronically



Wilcolator Model X
High-Capacity Gas
Valve and Oven
Thermostat

Temperature range:
200-550°F, plus broil

AGA rating, Btu/hr:
Manufactured gas—49,000
Natural gas—72,500
LP gas—154,400

calibrated

VIRTUALLY ELIMINATES FIELD CALIBRATION ADJUSTMENTS

Wilcolator has developed a new and completely automatic method of calibrating the Model X control. It eliminates all possibility of human error, assures precise calibration of each thermostat, and makes adjustment in the field rarely, if ever, necessary. Automatic calibration is just one of many advantages you get in this new high-capacity oven control. For full data on all its features, request Bulletin 547 (ranges with automatic oven ignition, Bulletin 548—Model XC).

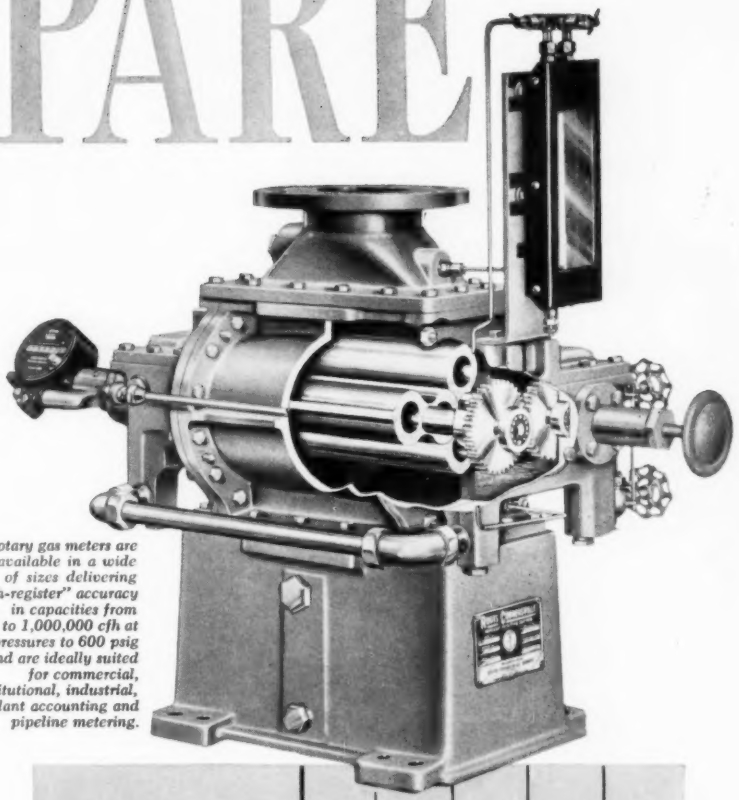
Thermostats for Every Heating and Cooling Application

THE WILCOLATOR COMPANY
1001 NEWARK AVE., ELIZABETH, N. J.
In Canada: Wilcolator (Canada) Ltd.
221 Evans Ave., Toronto 14, Ont.

THE Wilcolator COMPANY

COMPARE

More Capacity At Less Cost With R-C Rotary Gas Meters



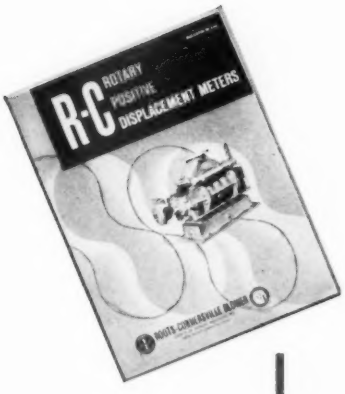
R-C rotary gas meters are available in a wide range of sizes delivering "cash-register" accuracy in capacities from 2,000 to 1,000,000 cfh at pressures to 600 psig and are ideally suited for commercial, institutional, industrial, interplant accounting and pipeline metering.

Comparative Analysis	SPACE OCCUPIED	TOTAL CAPACITY	METER COST	INSTALLING COST	TOTAL COST
FOUR DIAPHRAGM METERS					
ONE R-C METER					

As the comparative chart indicates, cost is reduced and capacity is increased with R-C rotary positive displacement meters. The total capacity of one R-C meter exceeds that of two or more diaphragm meters. Both initial cost and installing costs are substantially lower. Their small space requirements permit installation in otherwise unusable space. And operating costs are held to a minimum, since maintenance is confined almost entirely to lubrication of gears and bearings and to an occasional check of the operating differential.

Roots-Connersville rotary positive displacement gas meters provide a 15:1 operating range – metering unmatched by any other design. Precision-machined measuring chambers insure unalterable accuracy unaffected by variations in specific gravity, rate of flow, pulsations or impurities. And there are no valves, diaphragms or other small parts to wear and cause inaccuracies.

Pressure drop is minimized, since R-C's straight-through design eliminates winding passages and restricting ports. Even at low flows, these meters retain "cash-register" accuracy. These advantages are the result of R-C's specialized experience of more than 100 years in the design and application of air and gas handling equipment.



For additional data, please refer to pages 565-568 in **Chemical Engineering Catalog,** *our section in* **Mechanical Catalog** *or write for* **Bulletin M-258**

ROOTS-CONNERSVILLE BLOWER
DIVISION OF DRESSER INDUSTRIES, INC.
669 Oregon Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

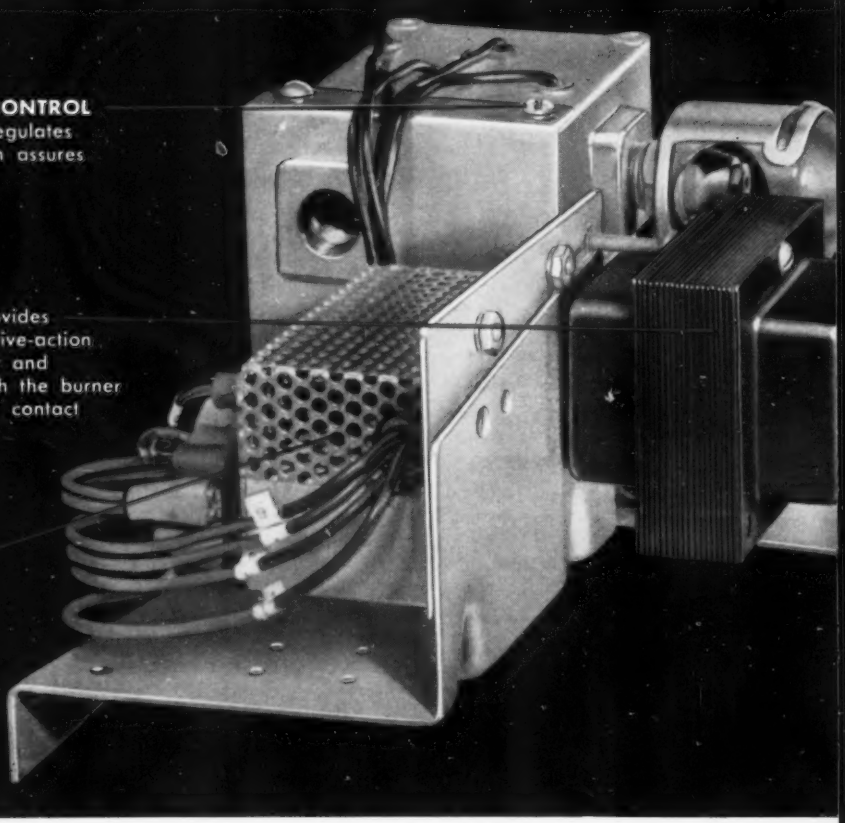
Sensational *NEW* Gas

AUTOMATIC

No more trouble-making

GLOW-COIL

or PILOT



DOUBLE-FUNCTION BURNER CONTROL VALVE controls gas flow and regulates pressure. Electro-magnetic design assures 100% tight shut-off.

IGNITION TRANSFORMER provides the spark-start. This simple positive-action component is energized by timer and thermostat — simultaneously with the burner control valve through the "cold" contact of the flame detector.

LOCK-OUT SWITCH AND HEATER protect against ignition failure, contributes to trouble-free coordination of spark and gas start.

Dryer Ignition System

SPARK-START

New Ignition package eliminates No. 1 gas dryer service problem!

This revolutionary development by Controls Company of America spells an end to the fuss and fury of housewives foiled by gas-dryer ignition stoppage. Your own industry service records show it's a problem most frequently caused by malfunction of pilot burner or igniter glow-coil.

CC's new, automatic, self-contained system *replaces both glow-coil and pilot with ignition by means of an intense electric spark applied directly to the dryer burner.*

Clothes dryer manufacturers are taking the lead in applying this revolutionary system — taking advantage of performance backed by intensive CC testing. It is proved and ready to deliver safe, sure-fire ignition . . . *every time.*

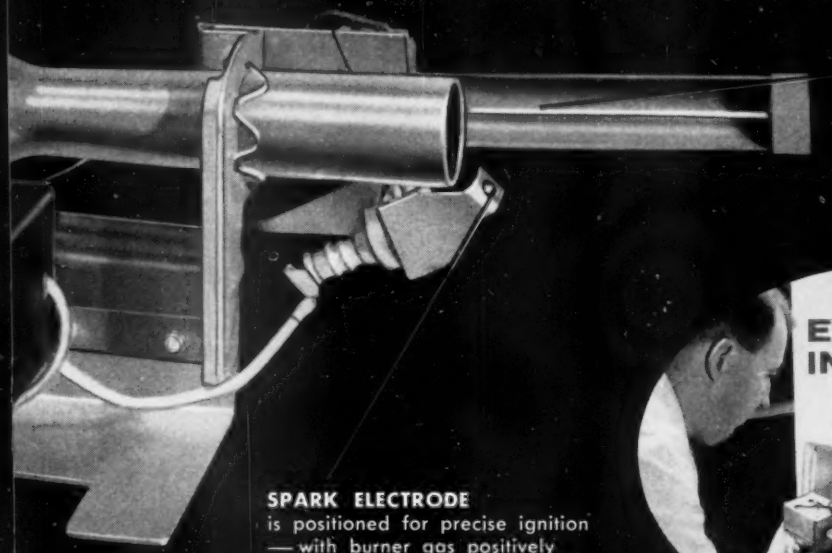
Write today for all the facts. Discover the full values of CC's "Control Systems Approach" to solving a costly problem.

Creative Controls for Industry

CONTROLS COMPANY OF AMERICA

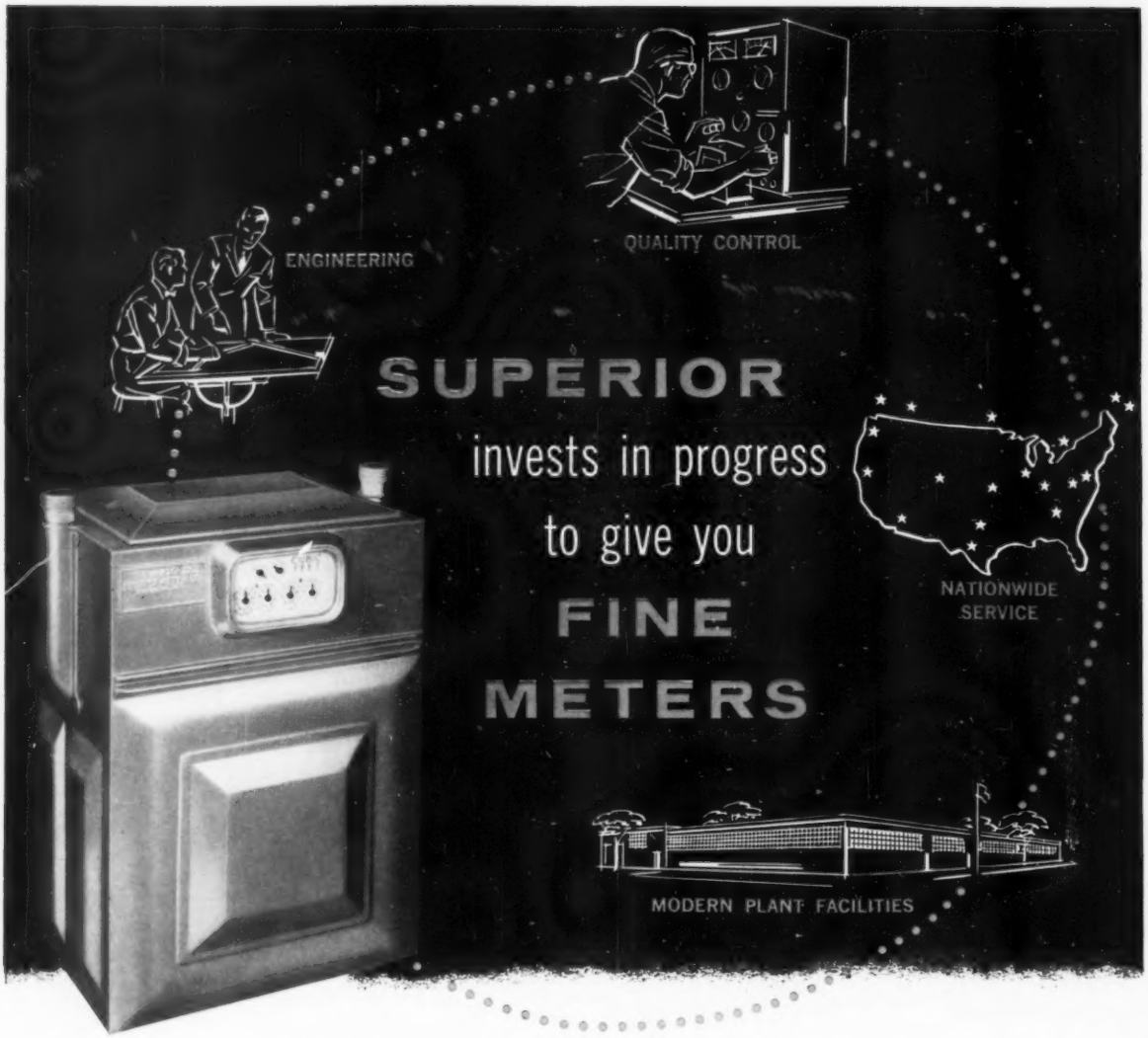
9603 Soreng Avenue • SCHILLER PARK, ILL.

Simple, Safe, Trouble-Free



FLAME DETECTOR SWITCH controls and terminates ignition spark. Actuates shut-off of main burner gas in the event of ignition failure.

SPARK ELECTRODE is positioned for precise ignition — with burner gas positively directed through the spark gap.



A larger staff of respected meter engineers...quality control specialists...nationwide sales and service... modern, high-precision machine tools... a brand new plant turning out the advanced-design Superior aluminum case meter, also the well-known tin case meters... that's the Superior Meter Company of today, now part of Neptune Meter Company, one of the world's major meter and instrument groups.

For Superior customers this means meters of sustained, fine-instrument accuracy, the result of one of the finest combinations of men, methods and machines. It also means a representative in your area who understands your needs and gives you service when you want it.

You now get more, at no extra cost, when you specify "Superior", the meter of enduring accuracy.

For Quality Meter Repairing and Repair Parts...
Superior maintains meter repair shops with rigid standards of quality control as an addition to your own facilities. Write or phone today.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

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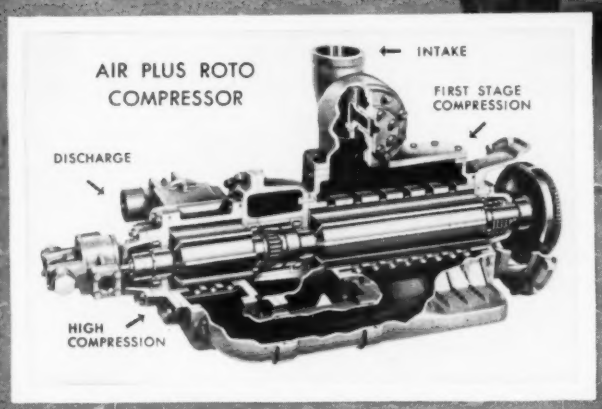
neptune

16

the pay off

The engine of this Jaeger rotary is the same GM 6-71 diesel used in other "600" compressors. But the Jaeger compressor is so much more efficient it delivers full volume at 100 rpm slower speed (1700 rpm instead of 1800). Think what this means to you in engine life and fuel consumption. Jaeger 125, 250 and 365 rotaries are comparably efficient. Ask us for full details or demonstration.



DRILLING BLAST HOLES ON 3′ CENTERS for approximately 8000′ of 12″ to 42″ sewer requiring rock excavation, at Minneapolis Airport. Holes were 3″, drilled to 9′ depth. Peter Lametti Construction Co., contractor.

THE JAEGER MACHINE COMPANY

661 Dublin Ave., Columbus 16, Ohio

Here's POSITIVE PROOF

Epi-SEAL

(EPOXY COMPOUNDS)

makes any leak "gas tight"

Above photo shows ¼" hole in fitting, hand-tight threads, holes in pipes, steel and copper with ends separated—joined together and made "gas tight" (CO_2) at 650 psi with versatile Epi-SEAL Repair Kit.

The Epi-SEAL Repair Kit revolutionizes service repairs. Whether it be a corroded section — leaking threads at a fitting, valve or plug cracks, breaks, holes (even in fittings)—steel pipe or copper tubing; all can be made "gas tight" with a safety factor of 5 to 1, even on high pressure systems, with the contents of this kit.

How else could such repairs be made — and with such simplicity, speed and economy? No need for special tools or skills . . . no worry about size, exact fit and later corrosion. All you require is in the Epi-SEAL Repair Kit. Compact enough to take little space on trucks, cars or tool carts — versatile enough to replace a truckload of fittings, clamps and tools for the variety of sizes and types necessary to fix all kinds of leaks.

Epi-SEAL Repair Kits are low cost and assure fast, economical and lasting repairs . . . a must for *every* truck, car and tool cart. Order your Kit *TODAY*.

The Epi-SEAL Service Kit contains more than enough material to complete *12 different repair jobs*. Kit contains: resin, glass tape, 2 types of reinforcers, stirrers, brushes, gloves, sandpaper, wire brush, solvent as well as complete instructions. Size: 6" high — 11" wide — 16" long.

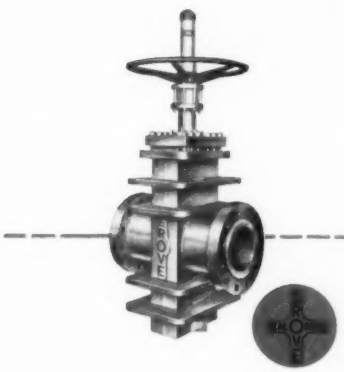
BONDED

BONDED PRODUCTS, INC.

Formulators and Manufacturers of Resinous Products for the Gas Industry

404 South Jefferson Street • Orange, New Jersey

You're never stuck with a GROVE VALVE



Here's the valve you set and forget. Grove's exclusive Seal-O-Rings wipe out the need for valve lubrication. You're never stuck with valve failure because of forgotten lubricant or depleted sealing compound. The load of lubrication is gone forever. Specify Grove Seal-O-Ring Gate Valves. Under pressure the tightest seal in the line.

Grove valves never require lubrication

GROVE VALVE and REGULATOR COMPANY

A Subsidiary of Walworth

65th & Hollis Street, OAKLAND 8, California

HOUSTON 27—3203 Mercer St. • LOS ANGELES 6—2559 W. Olympic Blvd.

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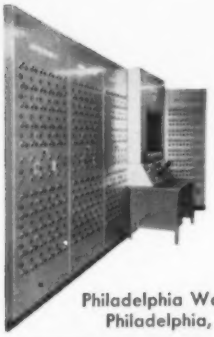
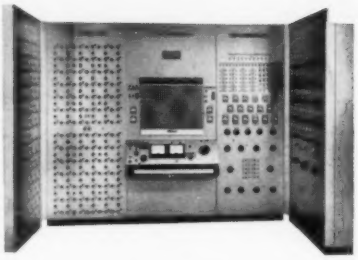
FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • LONGVIEW, TEXAS

In Western Canada: GROVE VALVE LTD., EDMONTON



Philadelphia Water Department
Philadelphia, Pennsylvania



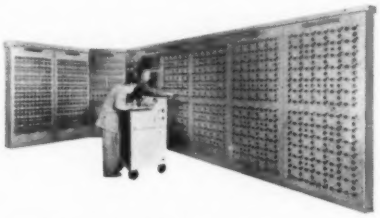
Baltimore County Department of Public Works
Towson, Maryland

McILROY
FLUID NETWORK
ANALYZER

Used by leading utilities to provide up-to-the-minute system analysis and to prove, in advance, plans for expansion and growth.

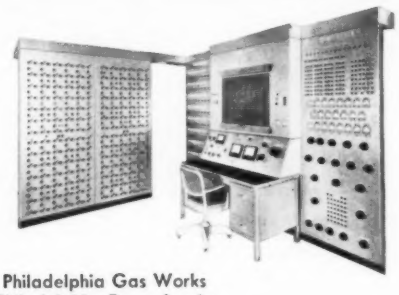
STANDARD
TRADEMARK

Washington Suburban Sanitary Commission
Hyattsville, Maryland



Public Service Electric and Gas Company
Newark, New Jersey

Southern California Gas Company
Los Angeles, California



Philadelphia Gas Works
Philadelphia, Pennsylvania

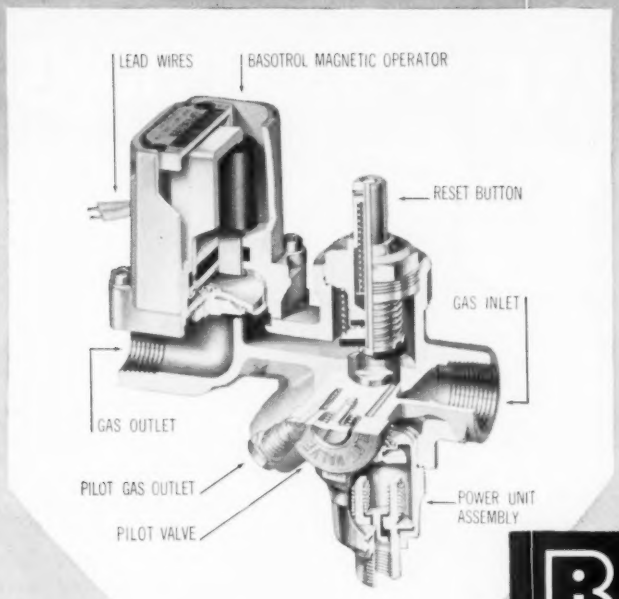
For information and a complete list of users of the McIlroy Fluid Network Analyzer, write to The Standard Electric Time Company, 89 Logan Street, Springfield 2, Massachusetts.

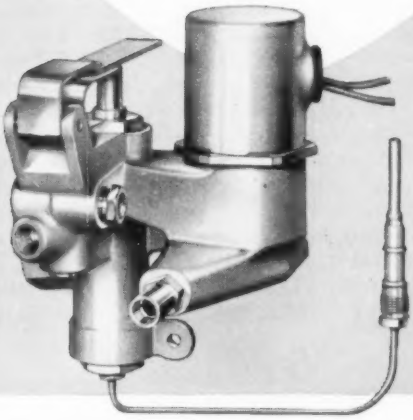
THE STANDARD ELECTRIC TIME COMPANY

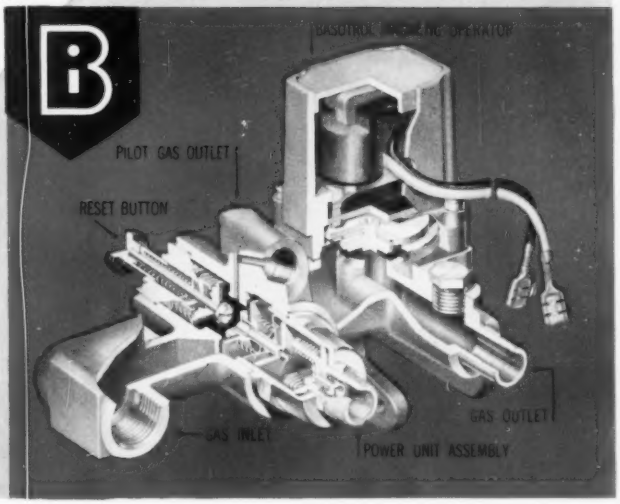
Springfield, Massachusetts

Here's flexibility in valve designs for your

GAS CLOTHES DRYERS







Look and Compare! Here's why automatic Basotrol valve designs are used in many gas clothes dryers: Flexibility in application meets product requirements . . . recognition by the gas industry of the reliable Baso® automatic pilot . . . use of dependable Basotrol bipolar magnetic valve with its simple, positive, a.c. automatic valve—both combined in one body casting with the Baso automatic pilot.

Convince Yourself! Before you select any other automatic valve for your gas clothes dryer, take another look at the cross section designs illustrated here. The Basotrol bipolar magnetic operator can be assembled to the valve body in any of three positions to facilitate wiring. Field service is easy because the automatic valve operator, the Baso power unit assembly, and the reset button are replaceable.

Brief Specifications! Capacities range as high as 77,000 Btu./hr. . . . valves with ⅜" F.P.T. inlet and outlet . . . standard current types in 20v., 115v., and 208-230v. Pilot tapping may be ¼" compression coupling, or ⅛" F.P.T., and some models include a rotor pilot valve by which the pilot gas can be turned ON or OFF.

Consult BASO! Call us and let our engineers help you with your control and pilot applications. For more product information, WRITE

BASO INC.

MILWAUKEE 1, WISCONSIN
Dept. SC-4

THE ANSWER TO CONNECTION PROBLEMS

BRANCH CONNECTIONS

MADE UNDER PRESSURE

The best and most economical method of making lateral or branch connections is to use Smith All Mechanical Joint Tapping Sleeves and Valves or Stopper Pieces. This method ELIMINATES GAS SHUT OFF and the permanent, leak-proof installation is achieved speedily by employing these simple procedures: 1. Block Sleeve Outlet Half under pipe, position side flange gaskets, bolt Sleeve halves together. 2. Position end joint gaskets; install follower rings, bolts and nuts. 3. Rotate Sleeve outlet flange to desired position, tighten follower ring nuts. 4. Tighten side flange gasket compression screws. 5. Attach Tapping Valve. The installation is complete and ready for tapping. 5. (Alternate) Stopper Pieces may be used in place of Valves when connections are made to low pressure mains and permanent shut off Valves are not needed; however, the use of Tapping Valves is recommended. The cost of the connection is reduced by quicker installation, elimination of skilled labor and costly jointing material. Bulletin will be sent on request.

51

FIRE HYDRANTS · VALVES · SINCE 1896

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

COOKING IN THE FIREPLACE
was romantic but hardly efficient. Heat was slow, uneven, uncontrollable . . . iron pots and pans, heavy. Feeding the family was work!

BASIC . . . but better than ever today

GAS "BURNERS WITH BRAINS" in today's kitchen . . . most recent achievement of the gas industry . . . "feel" and control heat in pots and pans . . . make cooking automatic . . . a pleasure!

Throughout the nation the cast iron gas mains of 55 major utilities are still serving after over a century of profitable operation. Cast iron pipe's quality is no accident. In our case, we assure it by controlling every production step. From mine to finished product, every length of pipe is subjected to exacting tests. This added care along our line contributes to smooth, trouble-free performance in yours.
You can depend on U. S. Pipe. Its performance is built-in.

SERVICE IS BUILT INTO CAST IRON

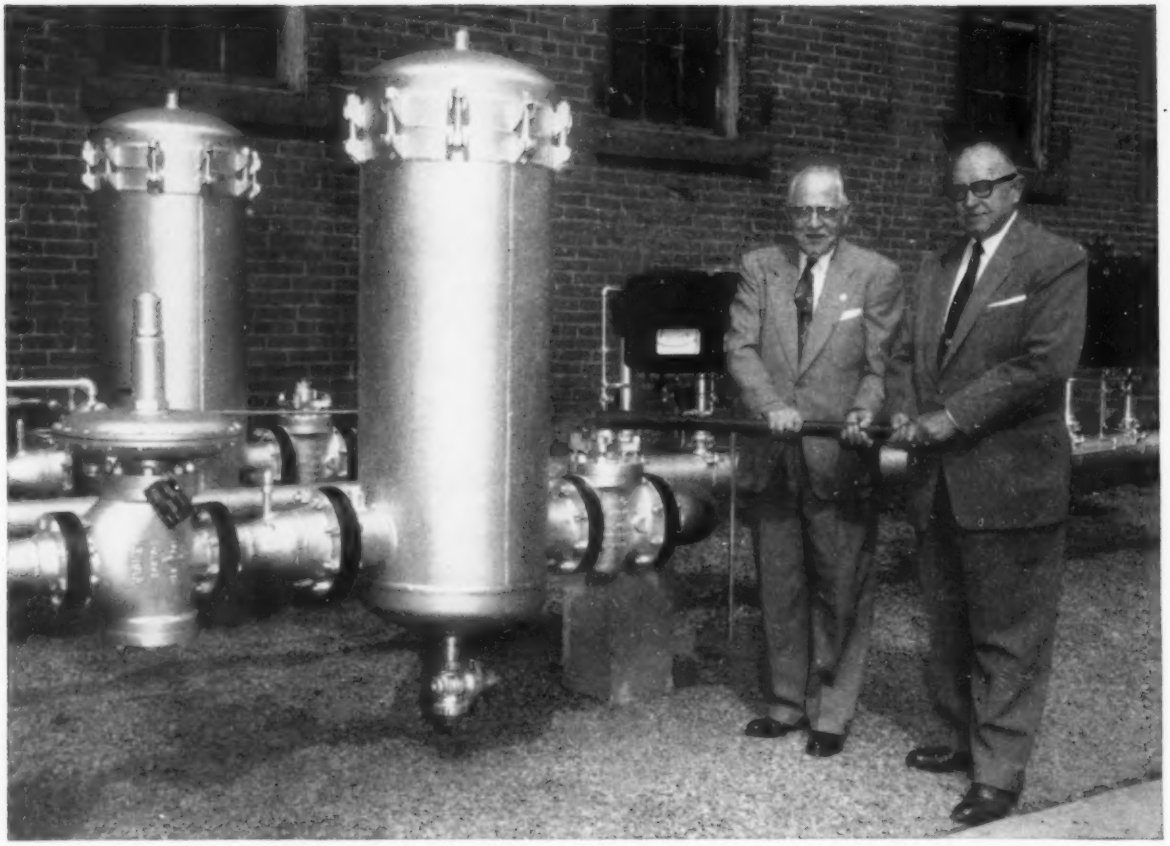
- Standardized mechanical joints are bottle-tight for usual gas distribution pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortages. Cast Iron pipe is immediately available.

U.S. cast iron PIPE

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

GEM Sponsor

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.



Charles H. Gueffroy, left, president of Portland Gas & Coke Co., and Carl E. Braun, vice-president and manager of Publishers Paper Co., Oregon City, Ore., "turn on the gas" at latter's plant. In foreground are two 6-inch Staynew filters, Model CPHG-10030, part of a large purchase by Portland utility.

Portland Selects Staynew Filters

for Natural Gas Piped from New Mexico

A spectacular 1,500-mile pipeline, bringing natural gas from New Mexico to Portland, Ore., promises a great new source of thermal energy to industries looking for locations, as well as savings of hundreds of thousands of dollars yearly to home gas users.

Portland Gas & Coke Co., which has been in business nearly 100 years, made a rewarding installation of Staynew filters in 1954, and, as a consequence, selected Staynew to filter much of its new supply of natural gas. Staynew filters purchased by the Portland utility in 1956 alone, it is conservatively estimated, are now filtering 25,000,000 scfd. It is also believed that more than 2,000,000 scfd are being filtered into homes by the new Staynew Model CPHB home gas filter.

Whatever *your* filtering problem, there is a Dollinger representative nearby, ready to help you solve it. Write Dept. 68, Dollinger Corporation, 68 Centre Pk., Rochester 3, N. Y.

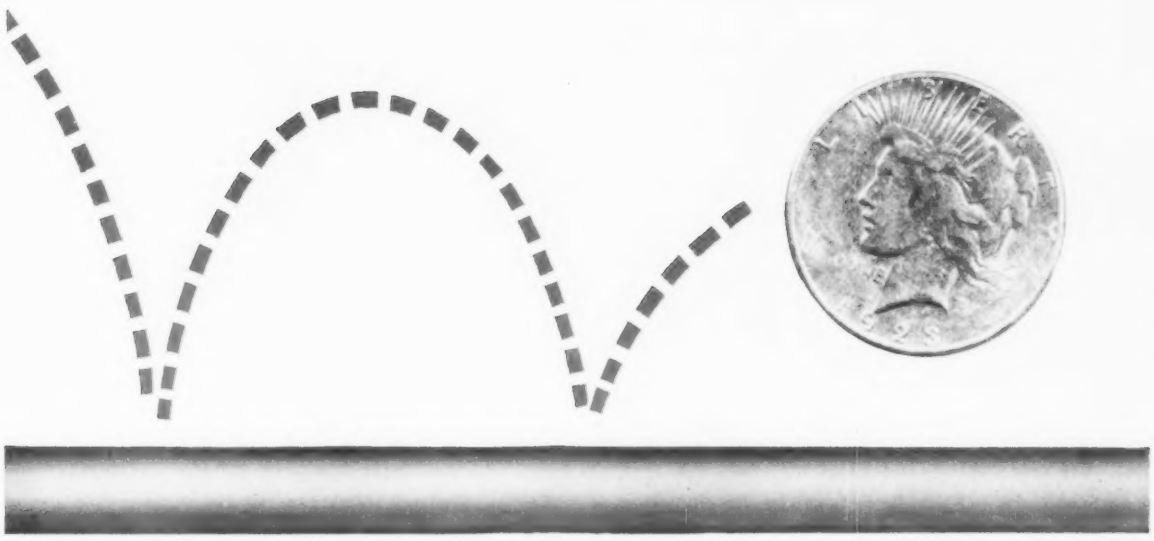
REG. PROTECTOMOTOR U.S. PAT. OFF.

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

TEX-TUBE lightwall pipe makes your pipeline dollar go farther



Take strength. Tensile strengths and working pressures of Tex-Tube Lightwall Pipe equal those of standard weight pipe of the same I.D.

Consider corrosion. If pipe wrap and cathodic protection are doing their job, why do you need a heavy wall?

In short, why buy "protection" you can't use? It's costing you plenty.

No wonder the trend is to money-saving, fully-proven Tex-Tube Lightwall Pipe.

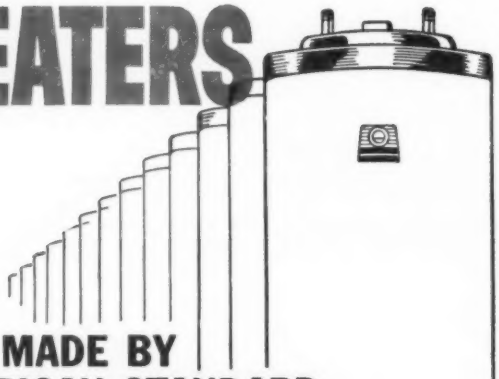
TEX-TUBE, INC

1503 NORTH POST OAK ROAD • HOUSTON, TEXAS

Sales Offices in Midland, Texas—Tulsa, Oklahoma—Baton Rouge, Louisiana—Los Angeles, California

LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

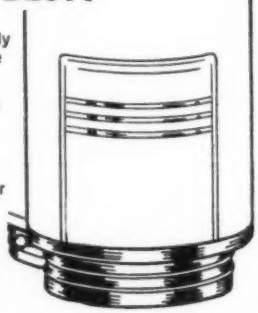
THERE IS ONLY ONE LINE OF PERFORMANCE RATED WATER HEATERS



IT'S MADE BY AMERICAN-STANDARD

THE PEOPLE WHO KNOW PLUMBING AND WATER HEATING BEST!

- With Performance Rating you easily match your customer's needs to the right size "rated" water heater.
- Performance Rating quickly makes you the water-heater expert; gives you quality and service to sell.
- Performance Rating means your customers won't run out of hot water
- Glass-lined or galvanized steel tank; 20 to 65 gallons; full price range.



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AMERICAN-Standard PRODUCTS

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PLUMBING AND HEATING DIVISION

GAS CALENDAR

June

1-5 . . AGA Air Conditioning Sales School—Baker Hotel, Dallas.
2-4 . . Appalachian Underground Corrosion Short Course —University of West Virginia School of Mines, Morgantown.
4-5 . . NEGA Residential Sales Workshop—Eastover, Lenox, Mass.
7-9 . . Wisconsin Utilities Association Accounting Section Convention—Lake Lawn Lodge, Delavan, Wis.
9 . . NEGA Operating Division—Worcester Polytechnic Institute, Worcester, Mass.
10-12 . . NEGA Gas Measurement & Control School—Worcester Polytechnic Institute, Worcester, Mass.
22-23 . . Michigan Gas Association—Grand Hotel, Mackinac Island, Mich.
22-25 . . Canadian Gas Association Annual Meeting—Empress Hotel, Victoria, Canada.

August

26-28 . . Mid-West Gas Association Gas School & Conference —Iowa State College, Ames, Iowa.

September

4 . . New Jersey Gas Association Annual Convention—Berkeley-Carteret Hotel, Asbury Park, N. J.
9-11 . . Pacific Coast Gas Association Annual Meeting—Ambassador Hotel, Los Angeles.
14-18 . . AGA Industrial Gas School—Penn-Sheraton Hotel, Pittsburgh.
15-16 . . AGA Accident Prevention Conference—Dinkler Plaza Hotel, Atlanta, Ga.
17-18 . . AGA Great Lakes Public Relations Workshop—Dearborn Inn., Dearborn, Mich.
24 . . NEGA Safety Conference—Sheraton Plaza, Boston

October

5-7 . . American Gas Association Annual Convention—Conrad Hilton Hotel, Chicago.
14-16 . . Wisconsin Utilities Association Operating & Sales Convention—Shroeder Hotel, Milwaukee.

February 1960

29-Mar. 2 . . AGA General Management Section Conference —Pittsburgh-Hilton Hotel, Pittsburgh, Pa.

March

14-18 . . National Association of Corrosion Engineers Annual Convention—Dallas.
21-23 . . Mid-West Gas Association Annual Meeting—Hotel St. Paul, St. Paul, Minn.
24-25 . . New England Gas Association Annual Meeting—Hotel Statler, Boston.
30-April 1 . . GAMA Annual Meeting—The Greenbrier, White Sulphur Springs, W. Va.

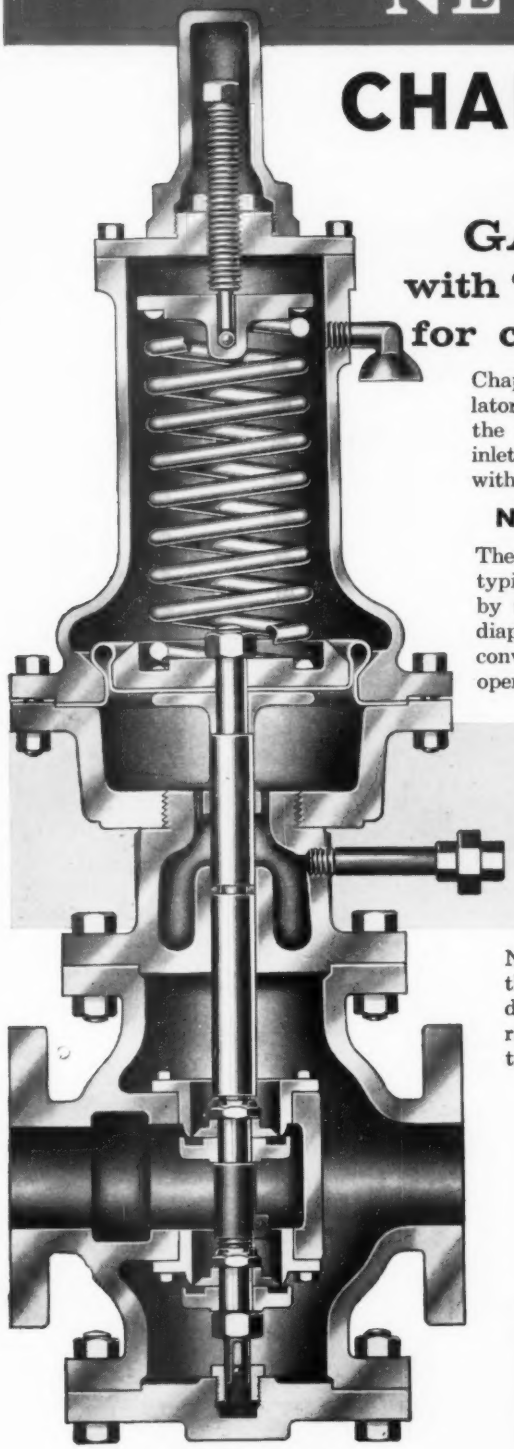
April

20-22 . . Indiana Gas Association—French Lick-Sheraton Hotel, French Lick, Ind.
25-27 . . Southern Gas Association Annual Convention—Galveston, Texas.

May

9-13 . . AGA Operation Section, Joint Distribution and Transmission Conference—Hotels Roosevelt and Jung, New Orleans.
16-18 . . AGA-Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.
23-25 . . AGA Operating Section Production Conference—Hotel Roosevelt, New York.

NEW IN PRINCIPLE!
NEW IN DESIGN!



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GAS REGULATOR

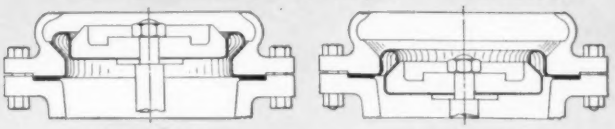
with "ROLL-OUT" Diaphragm for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

NO "FALL-OFF" AS FLOW INCREASES

The drooping characteristics or outlet pressure "fall-off", typical of conventional spring regulators, is eliminated—not by using an uncontrollable velocity effect—but by a new diaphragm design which actually reverses the action of a conventional diaphragm. It changes its area as the valve opens to compensate for the loss in spring loading force.

"ROLL-OUT" DIAPHRAGM PRINCIPLE



VALVE CLOSED VALVE OPEN

Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

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Write for Bulletin 57-S

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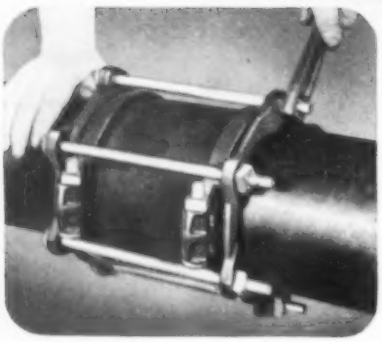

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PIPE JOINT CLAMP
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GAS

JUNE 1959

Set natural gas field prices by open competitive bidding—a possible solution to the dilemma of

Gas producer regulation and the gas distributor

By ROGER L. CONKLING, Associate

H. Zinder & Associates Inc., Washington

GAS exclusive

THE gas distributor has a heavy stake in the outcome of producer regulation. The millions of dollars under suspension in producer and pipeline rate cases arise largely from increases in the price of gas in the field. These millions of suspended dollars are a nerve-shattering question mark on the balance sheets and advance programs of distributors.

The distributor is the one actually on the firing line when gas field prices are increased. The distributor must face the public with the "end result"—the higher price of gas to consumers. Every rate increase requires an explanation and justification to the public, and rate increases are never welcomed. Also, consumer-end competition becomes more pressing with each rise in the price of gas. In many areas of the country gas is already faced with stiff competition from electricity, oil and coal.

Unfortunately, producer regulation has made little progress in the five years since the U. S. Supreme Court swept producers into the regulated fold. To a substantial extent, this lack of progress, in the writer's opinion, is a demonstration that the present cost-type route to regulation is a blind alley. It is probable that real progress, so essential to distributors—as well as to producers, pipelines and all concerned in the industry—can come only by making a fresh start along a different route. This is what is proposed here.

Petroleum production is not a "natural monopoly." Exactly the reverse, it is naturally competitive. Therefore, regulation of this industry should be viewed on an entirely different economic basis than for the conventional utilities. The economic conditions which led to cost regulation of the utilities are non-existent here. On the contrary, the large number of producers makes a competitive-type solution feasible and practicable.

To achieve the objective of a competitive solution which would protect the public interest, *it is proposed that natural gas prices in the field be established by open competitive bidding by producers.* Open competitive bidding would bring the entire pricing process under public scrutiny. The degree and effectiveness of competition could be fully seen. It is further proposed that the degree of competition among producers be even further enhanced by not recognizing collective or group bidding. Only individual bidding would be recognized. The Federal Power Commission would execute its regulatory responsibilities by enforcing competition and therefore a competitively determined price, rather than by attempting to establish a price through administrative procedures.

'Open competitive bidding is substituted for negotiation'

Most distributors employ competitive bidding for their major purchases, and are therefore familiar in broad outline with the mechanics which would be involved.[1] Distributors are also familiar with the fact that the Federal government makes all of its major purchases under competitive bidding (including its purchases of oil, for which it is reputedly the largest buyer in the world). Security issue of companies under the Public Utility Holding Company Act are sold under competitive bidding. Competitive bidding represents a method of pricing which has been tried and tested. The method leads to results which warrant full public confidence. *It is submitted that competitive bidding can be used effectively to solve the present producer pricing dilemma.*

It seems fundamental that any workable method of producer regulation must be fair, just and equitable to each of the concerned groups: producers, pipelines, distributors, and the consuming public. In essence, this means that producers must be content to receive reasonable prices and that distributors (speaking for themselves and their customers) must be willing that reasonable prices be paid. To achieve such an attitude of reasonableness the respective points of view of producers and consumers may have to be brought more closely into line. Both may have to compromise a bit.

Producers must recognize that they are now running a quasi-public business. The Supreme Court has decided that the Natural Gas Act provides that price regulation of producers is necessary in the public interest. This is an irrevocable decision under present law. Therefore, the prices producers charge for gas are now subject to public review and approval, and will continue to be. Producers may not be able to stand on the proposition that the present degree of competition must be accepted as fully satisfying all regulatory requirements. They may have to go beyond the degree of competition found in non-regulated industries. In other words, producers may have to face squarely the issue that if they wish to have competitive prices recognized they must offer *not just a normal amount of competition but the very highest degree of competition which is possible of achievement.*

Consumers also must look at facts squarely. The misconception of the producer as a cigar-smoking multi-millionaire reaping monopoly profits through deals arranged in a smoke-filled room must be dispelled. Today, ownership of the "majors" is widely held by the public (even as ownership of distribution companies is widely held). Ownership of the "minors" falls in all categories. But the smaller the ownership spread, the greater the risk. Often the lure of the big strike is an "all or nothing" proposition to the small producer. But whether he is part of a large or small operation, the petroleum investor is entitled to fair, unbiased treatment. Only thus, with reasonableness on both sides, can an acceptable solution be reached.

• Competitive bidding is NOT fair field price

Although this point probably is obvious, it should be emphasized that competitive bidding is far removed from fair field price, both in its implementation and in its economic effects. The two are completely different.

Under competitive bidding, the balance of bargaining strength as between producers and pipelines is changed. The situation is switched from one in which pipelines vie with each other for the purchase of gas, to one in which producers bid against each other for the sale of gas. This could have a material effect upon price. In addition to this reversal of bargaining position, open competitive bidding is substituted for negotiation. Any doubt as to whether competitive conditions have been fully met in any situation can be resolved by a review of the record. The gold-fish bowl is unobscured.

These differences are not an indictment of fair field prices as a regulatory technique. In all probability, fair field prices under proper administration could be made to work satisfactorily. However, the fair field price method has been thoroughly reviewed and rejected (at least to date) by regulatory authorities, distributors and other consumer interests. Therefore, the new and more effective competitive bidding approach should represent a more fruitful method for future consideration.

• Benefits to distributors and their customers

The benefits to distributors and their customers are clear cut. First, under the proposed competitive bidding method, a fully competitive price for natural gas would be assured. By reason of the natural laws of economics, this would be the lowest possible price sufficient to stimulate the required level of exploration and development for new reserves.

A fully competitive price is, of course, the result sought under any method of regulation. The aim of regulation is not to have one product subsidize another. It is that each product be sold at a competitive price, or, where competition is not possible, at the closest approximation of such a price. It must be admitted that under the proposed method of regulation gas would not be a "free loader," riding along on the shirt-tails of oil. But such a result is not a legitimate objective of regulation: certainly it is not an objective which distributors could espouse. This matter, however, is largely academic. Consideration of equity between products aside, the economics of petroleum production in this country are such that gas must stand on its own feet in the future, if further exploration and development of the scope needed to meet load growth is to continue.

It is possible that the present attempts at cost-type

[1] For brevity, the mechanics under which competitive bidding would be implemented are not described in this article.

regulation have raised gas prices in the field to higher levels than would have prevailed under a competitive method. It is well known that producers regard the present Federal regulation as burdensome and stifling. They much prefer to sell intrastate rather than interstate. In many cases, producers insist on price differentials as a compensation for selling into the federally regulated interstate market. In other cases, producers refrain entirely from selling interstate. A competitive method of regulation should eliminate producers' objections, siphon more gas into interstate channels, and tend to reduce prices to the lowest legitimate level.

Second, the fully competitive price achieved under competitive bidding would assure an adequate long-term gas supply for distributors and their customers at a reasonable price. This is the most effective way by which a long-term supply can be assured. "Cost" offers no such assurance as it has been pursued to date.

Third, the greatest element of uncertainty in the distributors' own cost picture would be removed by the establishment of a definite field price for gas. The multi-million dollar question mark would be erased. Thus a solid planning base would be substituted for the present uncertainty.

Fourth, distributors would not find it necessary to intervene in cost-type producers cases. This does not mean, of course, that the rights of distributors to intervene would be circumscribed. Distributors would retain full rights and opportunities to intervene when, in their judgment, fully competitive conditions were not met. The intervention problems in such circumstances would be straightforward. Complete knowledge of the technology and techniques of petroleum production would not be required.

The choice of a method of producer regulation is not a simple one. Nor is the role which distributors will play in that choice. This is best illustrated by a birds-eye view of the situation as it is today.

• The role of the distributor in producer regulation

It is probably safe to say that the position gas distributors now occupy in gas producer regulation would have seemed completely unbelievable to them just five years ago. In addition to intervention in pipeline cases, the distributor now frequently finds himself an active, vocal participant in the producer regulatory process. As an intervenor in producer cases, he often is cast in a role opposing producers as antagonist, objector, and cross-examiner.[2] In many respects, this is an ill-fitting and incongruous role.[3]

The development of distributor intervention has placed the distributor in an influential position to shape Federal regulatory policy, which is of advantage. But the distributor can exercise his influence in cost-type proceedings only by taking a position on many controversial issues of grave consequence to the entire gas industry. What is not of advantage in this situation is that the distributor must determine his position with no ground-rules to follow and, more often than not, with but a vague comprehension of the merits and possible consequences.[4]. This is far from a comfortable situation.

The distributor who does not speak out may be in an equally uncomfortable situation, possibly without fully realizing it. As circumstances are now, silence in the public forum or the hearing room, a shrug-of-the-shoulder attitude or just plain indifference, amount to taking a stand just as definitely as the voicing of a positive opinion. Inactivity *is* a position. Tacit acceptance *is* a position. *These suggest agreement that the present direction of producer regulation is satisfactory. They imply acquiescence in the recommendations being made by others.* Therefore, whether by his action or lack of it, the distributor must share responsibility for charting the future course of gas producer regulation. It goes without saying that the position adopted by the distributor should be an informed position, fully evaluated and developed at top management levels, for the matters involved cover some of the most important policy areas of the industry.

• Technical questions facing the distributor under cost-type regulation

The technical issues on which distributors must take a position in their role as intervenors in natural gas producer cases *of the present cost-type pattern* are so many and so complex as to almost defy description. The basic question under the cost-type approach is, of course, what is the cost of gas. At the very onset this question raises the proverbially unsolved joint-product problem. How can you determine the "*cost*" of the joint-product *gas*, the production of which is inseparably intertwined with the companion joint-products, the liquid *hydrocarbons?* The wisdom of Solomon cannot tell us what the respective costs are of the wool from the sheep and the meat from the sheep. Neither can we arrive at the respective costs of gas and oil. It is true that we can "allocate" total costs among the products. But what method of allocation—out of the many possible methods—are distributors to sponsor. Should they select and advocate what appears to them to be the most rational method (and the odds are that the most rational method selected by one distributor will be a different method than that selected as most rational by another distributor), or should distributors select and advocate whatever method will produce the lowest "cost" of gas? Completely aside from the technicalities of allocation methodology, this is a question which cannot be decided either by distributors or consumers without a few sleepless nights.

Difficult though the allocation problem is, it is only

[2] In an attempt to preserve some rationality and fair play, the distributor also may feel impelled to adopt the role of adjudicator.

[3] It is quite proper that distributors present their position on regulatory matters, either through intervention or other methods. It is somewhat questionable, however, whether distributors should have to assume the burden of the "public interest" case, which is a commission responsibility. The present situation is something akin to the "house divided against itself."

[4] The writer has often wondered whether the top managements of distribution companies have sufficiently concerned themselves about their position on the issues being debated in producer cases. As this article attempts to point out, such issues are of extreme significance in the formulation of principles and policies which will have a long range effect upon all segments of the natural gas industry. Much study frequently is involved to form even a cursory judgment as to the implications for any given segment of the industry.

one of many of equal difficulty which arise in the attempt to apply cost-type rate fixing to producers. What are the underlying economics of this vast petroleum production industry? How does more expensive, deeper drilling fit into the picture; what is the impact of less reserves found per more expensive foot drilled; how do you evaluate the increasing ratio of gas to oil; is the ever higher royalty payment and the greater and greater override a matter of consequence? What position, Mr. Distributor, do you take with respect to the economic effect of: *offshore exploration and development* (are the tremendous expenses and hazards of offshore work being offset by larger reserves?); *spacing* (will wider well spacings tend to lower costs?); *multiple completions* (are these a technological change which can compensate for increased costs in other areas?); *deliverability* (to what extent does maintaining deliverability place an added cost burden upon current and future production?); *farmouts* (how do these affect costs?). How do *production allocations* fit into the picture? What cost treatment should be given to revenues from the sale of *liquid hydrocarbons* produced in association was gas?

Some of these questions may present new issues and even new terminology to any single distributor. Nevertheless, each poses a lively debated issue which has been tossed back and forth extensively in the producer rate cases held to date.

Moving on, a larger cost question presents itself. Can the test year concept, adapted to the normal utility situation, be made to fit the peculiar increasing cost conditions of the petroleum industry?

With respect to specific cost elements, tax treatment is a special issue. Should the producer be allowed the benefits of depletion allowances and intangible well drilling cost write-offs, or should the producer be permitted to include in his cost of service only taxes actually paid? The discerning distributor will recognize immediately that this question is not completely unrelated to the accelerated depreciation issue which distributors themselves face.

Rate of return is another large area. Is a rate of return comparable to the conventional utility pattern adequate, or does this industry require a speculative rate of return? The "lure of the big strike" has dominated the petroleum industry. How big does this lure have to be? Or, if it is to be discarded, what is to take its place?

Distributors are beginning to take into consideration the possibility that "cost" as a regulatory approach could well increase the actual cost to purchasers of gas in the field. In the petroleum industry it is safe to say that millions of dollars are lost each year in unsuccessful ventures. These now represent zero recovery, zero return investments. Under the cost route, presumably all these unsuccessful investments will be properly includable in the cost—and therefore the price—of gas. Is it more in the public interest that the "lure of the big strike" be permitted to continue to exist as a reward for the successful venture, or is it better that this lure be eliminated and the costs of both successful and unsuccessful, wise and rash, effects be recoverable?

The list of questions is still not complete. A final large area remains. Having achieved the miracle and found costs, how then are costs to be applied to prices? Should costs be computed on a company-wide basis, or by fields or areas? Should the prices associated with such costs be average, uniform prices or the differential prices resulting from arm's-length bargaining?

These are questions, not answers. An attempt to formulate an informed and well-considered opinion on even one of these questions drives home the fact that the role of the distributor as an intervenor in cost-type proceedings cannot be a simple or easy one. In intervention activities, distributors *must* take a position on many if not all of these technical issues, any one of which is of sufficient importance to warrant lengthy study and deliberation at top policy levels. As before pointed out, even the distributor who does not intervene cannot afford to ignore these matters. Under cost, sooner or later he must cast his vote, unless he wishes his influence to go by default.

• Philosophical questions facing the distributor

The philosophical questions facing the distributor are perhaps of far greater long-run importance than the technical questions enumerated above, for the way these philosophical questions are answered can have a sizable impact upon the economic and political future of our nation.

The difficulty of arriving at an acceptable method of allocating the total cost of petroleum production between oil and gas, which is necessary to arrive at a "cost" of gas, is so great that some are thinking that the only solution is to eliminate the problem by regulating both oil and gas. This would leave the *total* cost of petroleum production as the meaningful figure. Thus, the cost-type route to gas producer regulation is leading in the direction of total regulation of the petroleum industry. The question each distributor must ask himself, therefore, is not just whether he should embrace or reject "cost," but whether he desires to add his efforts to those of others in the direction of bringing another industry —oil—under regulation.

These also are questions, not answers. The answers can come only from the managements of the distribution companies, as in their own best judgment they decide how they wish to act. If this article has helped a little to clarify the issues, or if it has stimulated an awareness that time is running out, then it will have fulfilled a useful purpose even if competitive bidding is not the answer. ■

Welding a 1-in. X-Tru-Coat service line.

Cathodic protection requirements of plastic coated pipe

Completed wrap on 1-in. service line field joint.

THE Western Kentucky Gas Co. distributes natural gas to 57 communities in western Kentucky. The over 1000 miles of main in the company's system range in age from cast iron pipe installed in the late 1800's to mill coated steel pipe recently installed. Our present standard coating is 4/32 in. of coal tar with a glass and felt wrap. All pipe is cathodically protected as it is installed. To date, over 500 miles of the system has been cathodically protected.

The company is continually testing new materials of construction to obtain the best and most economical materials available. Early versions of plastic coated pipe had many defects and were not considered an acceptable-coating material. The most recent version of Republic's X-Tru-Coat, however, seemed to have merit and a sample was installed in our "test pit."

This test consists of installing a coated sample in very corrosive soil, using normal backfill precautions, and subjecting the sample to a 6-v positive potential. The coating conductance is measured daily and failure is indicated when the conductance exceeds 40 micromhos per square foot. Although this test has many shortcomings, it has been very effective in spotting coating faults which would require several years to discover under normal burial conditions. Very few coatings have lasted more than three months under this test. The X-Tru-Coat sample still shows practically zero conductance after about eight months of test. Based on this and other tests, management authorized the use of this coating on two small distribution systems.

The towns chosen are in the midst of the western Kentucky coal fields. Streets in these towns are built up of coal mine residue hauled in from the surrounding coal fields. As a result, the soil is acid and extremely corrosive. Ground water has a high sulfur

GAS exclusive

By T. E. BRADY, Corrosion Engineer
Western Kentucky Gas Co., Owensboro, Ky.

Riser bend is heated slightly after bending to relieve stresses in the high density polyethylene coating.

Primer is applied to pipe and 2 in. back on coating prior to wrapping with polyethylene plastic tape.

and copper content and soil resistivities average less than 1000 ohm-cm. In addition, the threat of stray currents from the surrounding coal mines is present. Each town consists of slightly more than 30,000 ft of 2-in. and 3-in. plastic coated pipe. Field joints were coated with a polyvinyl tape that had performed satisfactorily in our tests. Since the tests showed that this tape was subject to spiral corrosion in the absence of a primer, a primer recommended by the tape manufacturer was used. This primer also greatly increased the bond between the X-Tru-Coat and the tape.

The transmission line consisted of only 8000 ft of 2-in. pipe. Since this was our first practical use of the coating the transmission line was "jeeped." Because of the low incidence of holidays, this practice was not continued on the distribution system. The transmission line was insulated on each end and one 17-lb magnesium anode was installed. Cathodic protection tests were conducted one month after completion of the line, after several hard rainfalls had consolidated the backfill. These tests showed that the entire line had polarized to an average potential of 1530 millivolts with reference to a copper sulfate electrode, and that the current drain from the anode was only 0.2 milliamperes. Calculating the coating resistance by the delta E-delta I method gives the amazing coating resistance of almost 20 million ohms per square foot, by far the highest we have ever attained.

Such high coating values were, of course, not expected in the distribution systems. The coating on distribution pipe is abused by the necessity of dragging the pipe over and under numerous foreign structures, the necessity of field coating several tie-ins at each street intersection, and the existence of a difficult-to-coat service tee about every 100 ft.

In order to facilitate testing and trouble shooting, each town was electrically divided into two approximately equal sections by means of insulating Dresser couplings. No electrical holiday detection was made on the coating, but we did employ a good visual inspection along with our "magnesium anode inspector system." Under this system, a magnesium anode is installed on the pipe during the first day of construction, and one pipe to soil reading is made at the end of each day's construction. Although this system gives no absolute indication of the coating condition, a sudden drop in potential will sound the alarm on contacts with foreign structures, shorted casings and large sections of uncoated or poorly coated pipe. This system has proven useful to us in the past in rapidly locating, and having the contractor repair, contacts with foreign structures. This system is additionally

Completed field wrap on 3-in. X-Tru-Coat pipe.

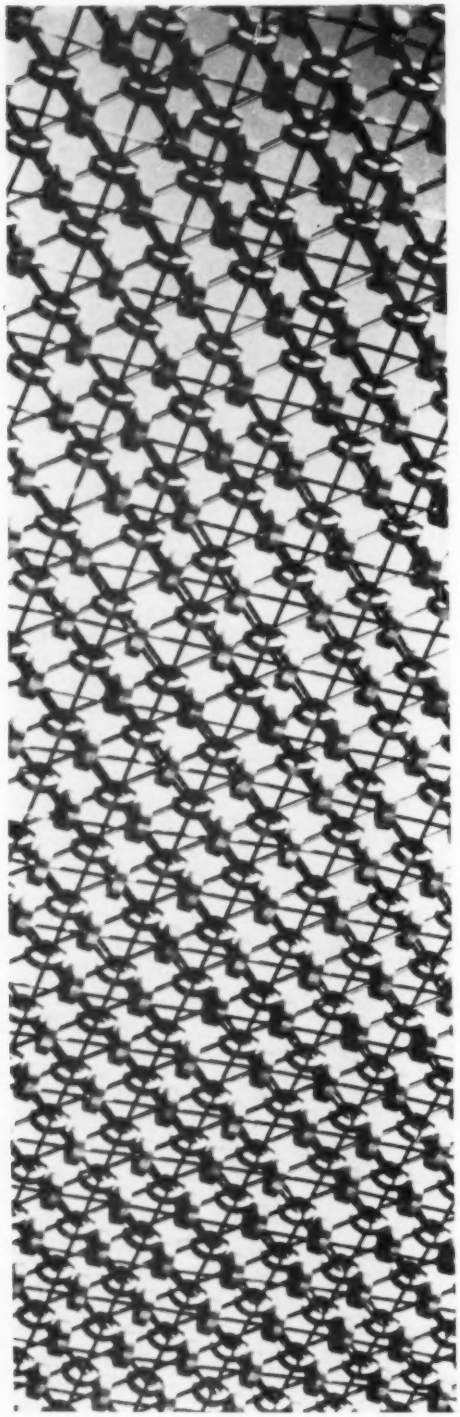
Cleaning field joint with wire brush.

advantageous in that the cathodic protection installation is complete, except for final testing, as soon as the last joint is installed. On this particular job these "silent inspectors" gave no alarm.

Since each town was divided into two sections, one anode was installed in each section to make them electrically independent. Cathodic protection tests were conducted about one month after completion of construction. In making the tests, the sections were bonded and only one anode was attached to the main. Our tests proved that one 17-lb anode provided full protection in each town. In one town, an average potential of 1350 millivolts was attained with 61 milliamps of current and in the other, a potential of 1150 millivolts with 63 milliamps. Current requirements in both towns averaged .0032 milliamps per square foot. This is quite close to our average requirements of .0035 milliamps per square foot on coal tar coatings. The current requirements in the various sections, however, varied widely. In one town, for instance, the northern section required .004 milliamps per square foot and the southern section required only .001 milliamps per square foot. It is felt that the section with the higher current requirements had several dead ends that were not coated. Some of the dead ends were not coated originally since we anticipated returning to them when the system was purged, and it is possible that they were left uncoated. We have not as yet investigated to confirm this suspicion.

We were well pleased with the low current requirements and the ease of handling this plastic coated pipe. The toughness of the coating makes it particularly adaptable to the rough handling required in distribution piping. Holidays are very easy to find visually since the coating is not covered with kraft paper, and the holidays stand out vividly against the yellow coating. Since the coating was stored for only a few weeks before use, we have no experience on its adaptability to outside storage. We now have tests underway which should provide information on this.

Since the cathodic protection tests were made soon after completion of construction, the current density values are not necessarily the final values that will be attained. However, due to the nature of the coating, no substantial increase in current is expected. Because of the extremely high resistance of the transmission line coating, the slightest deterioration of the coating will be revealed immediately by an increase in current demand and a decrease in pipe potential. Permanent pipe to water indicating meters are being installed on each system and the monthly report on these readings will serve as a continuing history of the coating condition. ■



GAS exclusive

The basic elements of

Data processing of paperwork

By H. H. BOCKSTEGE JR. and W. M. KING JR.
Consultants, Commonwealth Services Inc.

DATA processing—what is it? We have heard so much about integrated data processing, electronic data processing and machine data processing, that it is difficult to tell the exact meaning of these high sounding words. We are sometimes so overwhelmed by what we think these terms imply that we neglect proper investigation of our data processing problems and their solutions.

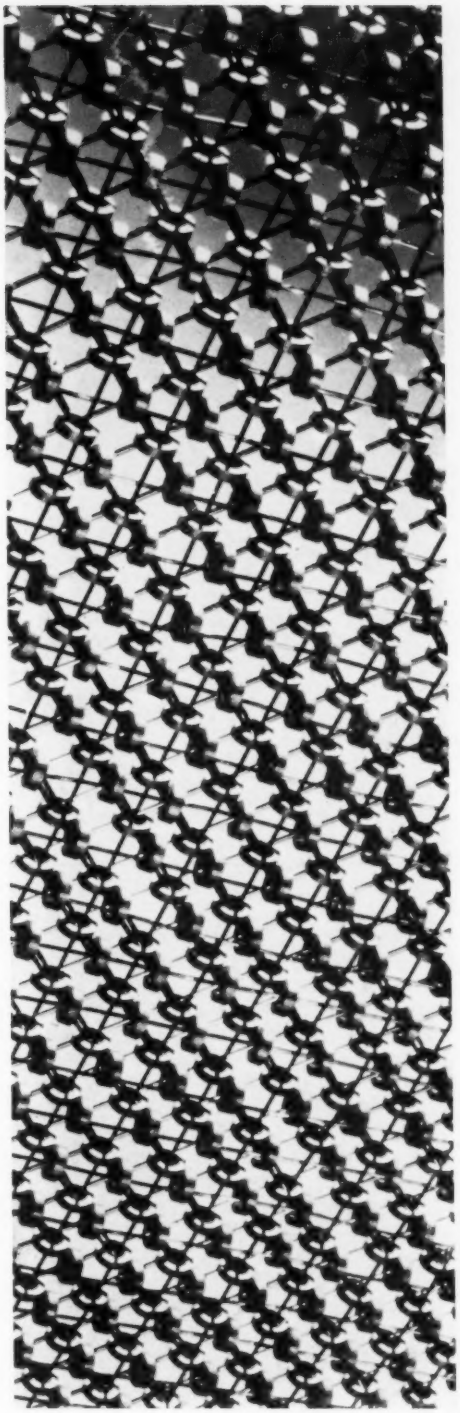
All office paper work consists of the input, storage, processing, control and output of data or information. In its simplest form, data input is the writing of information on paper. Data storage is simply the filing of papers or information they contain. Processing is the addition, subtraction and other computations involved in summarizing information to a usable form. Data control is always present, though more inefficient in some systems than others. Output is the resulting answer from the processing of data, whether it comes from a bookkeeper on a high stool or an electronic system.

Data processing *is not* a type of machinery. It is a method of handling basic information or paper work, and people are the most important factor in this process. With all of our talk about electronic machines, we should always remember that such machines should be designed to elevate and extend the position of individual workers.

• Importance of data processing for company records

Competition and rising costs are increasing the demand for quicker, more complete, and efficient record keeping. It is important that every company examine

and comparisons handling methods



its data processing procedures and select the best data processing method to accomplish desired results at minimum cost.

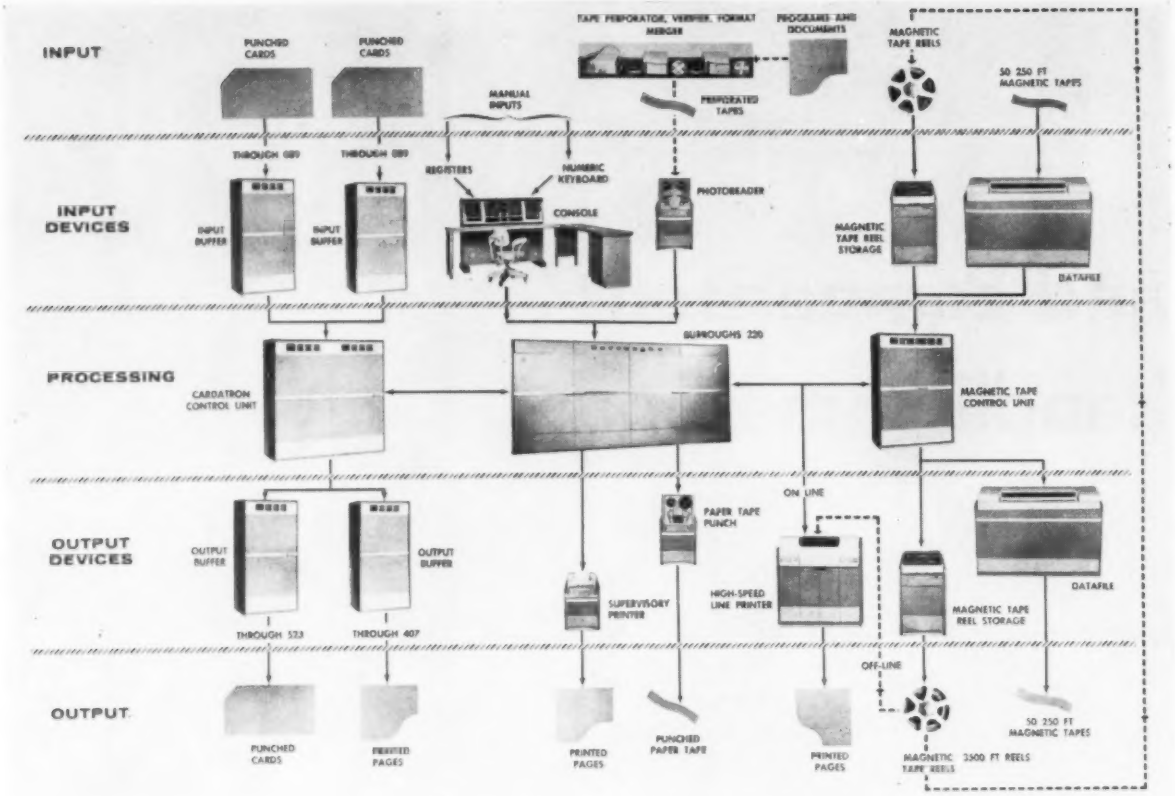
Such discussions should not be limited strictly to accounting. Records are necessary in practically all forms of business activity, and the importance of statistics and studies to guide management in research and planning, as well as in financial control and engineering, is basic. The development of these statistics and studies usually involves extensive use of data and records. The records themselves, together with the procedures and devices used to compile or calculate data, make up the data processing system in use.

Manual Data Processing. In some manual installations, paper work is handled two, three or four times before the end result is produced. Costs can often be cut drastically if this data can be recorded in mechanical form once, and then used in that form for all subsequent operations.

Machine Data Processing. To effect such economies, we can develop mechanized procedures for the

These tiny ferrite cores comprise the "memory" of some data processing systems. Thousands of them—each about the size of a pinhead and shaped like a doughnut—are strung on a complex of wires in such a fashion that several wires pass through the center of each core. Combinations of electrical pulses on these wires alter the magnetic state of cores, and a line of them—some altered, some unaltered—stands for a certain word or number. A word or number stored in the machine's memory in this way is available for calculation in 12 millionths of a second.

PART I OF A TWO-PART ARTICLE



Data processing is a method of handling basic information or paper work. Data pass through this equipment during processing.

handling of such data, or paper work, and thereby arrive at the term "machine data processing." Machine data processing can use electronic equipment, but it need not. Many manufacturers produce office equipment for use in preparing or compiling data as it is being processed. Even the use of manually operated equipment is now termed machine data processing. Data processing *does not* depend on the use of a specific type of machine, but on groups of machines designed to be used together for maximum efficiency in each individual situation. Some of these machines are conventional tabulating equipment, where data are processed through different machines, such as reproducers to create punch cards, sorters to arrange cards, collators to bring different data together in a given pattern, and small basic calculators to do arithmetic calculations.

Electronic Data Processing. Some electronic calculators are not considered "giant brains." Data processing with these electronic calculators must be differentiated from more advanced systems, in which the intermediate processing steps of tabulating, sorting, reproducing, collating and calculating are avoided or accomplished completely within the confines of one large electronic system. When such is the case, we leave electronic calculators and are in the area of electronic data processing.

The IBM 604 Series and 607 Series calculators process data in the same routine and orderly manner, but on a limited basis. The 604 Series, for instance, is built to memorize or store 20 to 60 individual instructions. The 650 computer has the capacity to memorize or store 2000 individual instructions and to modify the data with which it works on the basis of material being read into the machine in the course of its work. The computer is built to alter its course of action on the basis of new data, while the smaller calculators are limited in this respect. The computer can select data from storage, and properly collate and calculate the desired answers. Both the calculator and the computer are electronic equipment, but, as you can see, there is a basic difference in their processing of input data.

Integrated Data Processing. Data processing becomes integrated data processing when the data are processed initially to minimize repetition and duplication of manual handling in the succeeding steps. It is essentially concerned with the preparations of source material and is possible without electronic computers. Choice of a particular system depends on the complexity and volume of a company's paper-work load.

Machine Data Processing Compared with EDP. Since the use of the basic office machine in data processing is elementary, it is important to differentiate between machine data processing using key operated machines, punch card equipment and more advanced data processing, using electronic computers. Simple

key operated machines carry data forward on individual ledger cards, and the only data input is made by the operator as she uses the keyboard to make individual entries. With punch card equipment, data are carried forward by the medium of punched cards. These punch cards contain the machine language of the data to be processed. The operator feeds the cards into the proper machine and manually sequences various operations involved in compilation of payroll, billing, etc.

In electronic data processing, on the other hand, the equipment includes electronic computers which differ radically from mechanical equipment. The processing or handling of data is accomplished by using electrical impulses and storing such impulses electronically or magnetically. This development makes it possible to operate at extremely high rates of speed and to store a complete program internally. This program is a set of operating instructions which the machine follows.

Punch card equipment adds, subtracts, multiplies and divides under the control of a predetermined program or plan built into the machine. The operator has access to the control panel wiring and must modify the factory-designed plan to fit his needs.

In the modern electronic computer, the plans controlling manipulation of the data through the machine are not permanently built into the machine. Rather, the machine's plan is created by the user, fed into the machine and stored in its memory. This plan permits the machine to manipulate data within it, according to stored instructions. This flexibility of electronic data processing machines requiring the user to develop his own machine instructions or program presents a basic problem to the user. Punch card machines do their work in a fixed and limited manner while the computers require intricate programing. Once developed, this programing allows for intricate processing applications.

Preparation of Source Documents for Punch Card Systems. In the preparation of raw data for electronic processors, it is necessary, at some stage, to enter the data on cards or tape, for these are the input media for all information. In the punch card system, source documents are usually prepared manually or by typewriter. In many applications, the punch card itself can serve as the source document. The punch cards are prepared for input by either mark sensing or direct punching of holes. In the mark sensing method, marks or characters upon cards are automatically converted into punched holes. Card sorting and collating machines assemble, sort, match, merge and classify the data. A variety of machines, including electronic calculators, can perform the various arithmetic computations. To a great extent, manual filing of bulky records gives way to mechanical maintenance of card files. Computation results can be summarized by tabulating printers, thus adding to increased mechanization.

Drawbacks of Punch Card System. Although the punch card system has eased clerical work, two characteristics have tended to limit the extension of its use:

1. Its inability to handle exceptions within the normal machine routine, necessitating manual handling in that area, and
2. Its limited processing operations. The lack of memory storage means that complex problems must be solved in pieces, instead of in one continuous process. These limitations can be overcome by an integrated electronic data processing system.

Components of an Electronic Data Processing System. The computer or basic element of an integrated electronic data processing unit, has three parts:

1. The control unit, which interprets the instructions and controls the processing.
2. The arithmetic unit which, as its name implies, performs the necessary addition, subtraction, multiplication and division, and reaches decisions by comparison.
3. The memory or storage device, which stores electronic pulses. This memory consists of nothing

The IBM 650 data processing system can handle both commercial and scientific problems. At work in every type of enterprise, the medium-sized 650 computer has been termed the "workhorse" of electronic data processing. It consists of three units—a punched card input-output unit, a console unit containing the magnetic drum providing up to 20,000 memory positions for storing data and instructions, and a power unit.

more than an electronic device which can analyze a group of similar data, thereby simplifying the human operator's job. The analyzing is done by the arithmetic unit and must be taken electronically from the storage unit. (These three components are not *in addition to* the electronic computer but form an integral part of the electronic computer.)

Source Document Preparation for an Electronic Data Processing System. In the electronic data processing system many of the basic functions of record keeping are handled at electronic speeds. The preparation of source documents is generally performed by the same means as those employed in the punch card system. This step and the transfer of data from the source documents to a form acceptable for electronic processing are accomplished by input preparation equipment. This equipment transcribes source data on paper tapes or punched cards by the direct punch or mark sensing method, aided by an intervening mechanism which converts the data into a code, the language of the electronic system. The data may go on magnetic tape, paper tape or punch cards, but magnetic tape is by far the fastest.

Not all electronic calculators are "giant brains." Desk size equipment, such as shown here, is widely used.

In the actual manipulation of the data, all assembling, sorting, classifying, referencing and arithmetic operations are performed automatically within the components of the system, directed by a series of stored or programmed instructions. It is mainly the performance of this manipulation function that sets apart the electronic system as unique. It is there that the electronic system gains its greatest advantage over others. The storage capabilities of the system make possible the retention of data for master files, carry forward balances, intermediate results and other complex sets of information. This relieves the need for temporary filing, separate cross references and other manual handling. Access to stored information, intercommunication within the system, computation and decision making, all occur in the manipulation function at electronic speeds. Results from electronic data processing are drawn from the central processing unit, written upon magnetic tape, paper tape or punch cards and fed into automatic printers. In a well integrated system, output data may be produced by direct connection between the processing unit and the printing device, eliminating tapes or cards.

Advantages of EDP. If maximum advantage is to be obtained from electronic equipment, those planning its use will need to take a broad approach to the data processing requirement of their respective companies. Electronic equipment will prove its value much sooner if it is used to make automatic decisions rather than to produce material more quickly for human decision. Integrated electronic data systems should not be used as high speed clerks.

Properly programmed, EDP can be a tremendous management tool. Here are some examples applicable to the gas industry:

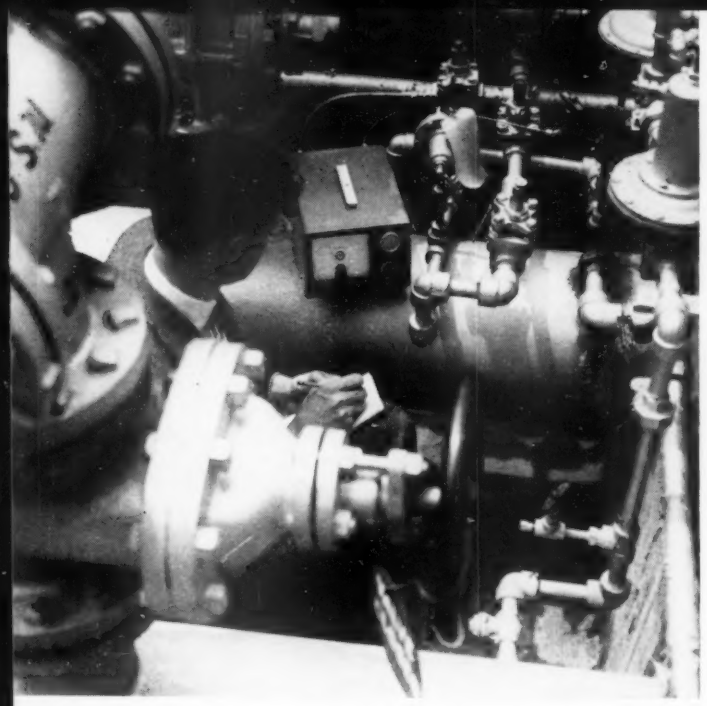
1. Flow calculations to determine the size of pipe and compressor stations; and to determine where existing systems need strengthening due to increased loads.
2. Dispatching of gas from various producers' wells or gathering systems into the pipeline system.
3. Measuring and computating the cost of purchased gas.
4. The handling of underground storage problems.
5. Controlling inventory of material and supplies.
6. The usual accounting applications such as customer billing.

The use of electronic data processing offers management many opportunities to reduce and keep within bounds mounting clerical costs by eliminating most of the human intervention now necessary in the data processing cycle. Use of equipment operating at electronic speeds, combined with modern communication methods, can make it possible to substantially reduce the time lag in preparing many reports to management.

EDP Systems—Limitations. In the electronic data processing system as we are considering it, the electronic computer performs the arithmetic computations, classifies the data and edits the results. The computer makes decisions and directs the activities of the input and output components, and the data is manipulated and stored by electronic pulses. However, the electronic system will do only what it has been told to do. It is directed by a detailed step-by-step program of instructions regarding the routine and any exceptions to this routine. These programs take many months, or years, to perfect, and their successful creation and operation depend on the essential human being. ■

* * *

In Part 2, which will appear in the July issue of GAS, Messrs. Bockstege and King evaluate company needs for electronic data processing, tell how to conduct a feasibility study, and outline the steps in equipment installation.



PART ONE OF A TWO-PART SERIES

Fig. 1. Portable moisture analyzer in use on a gas pipeline.

GAS exclusive

Stream analyzers—a continuous approach to improving control

By D. J. FRAADE,* Consolidated Electrodynamics Corp., Pasadena, Calif.

NATURAL gas is made up of a number of saturated hydrocarbons. Its chief components are methane and ethane, both colorless, combustible gases. The other components are a similar group of hydrocarbons which vary in volatility and other properties, but are usually observed in small proportions as compared with methane and ethane. These are known as "heaviers" and may include propane, butane, pentane, hexane, heptane, octane, and smaller amounts of many other heavier hydrocarbons.

As the gas industry grew, the competitive market for natural gas became tighter, and exploration, production, processing, transmission and distribution companies became vitally interested in more product yield for the same capital investment. In other words, new advances in the art of process automation were becoming more attractive for squeezing out the last penny of profit from processing operations.

The period following the end of World War II was high-lighted by a flurry of new devices and concepts in the art of process automation. They included graphic panels for increased ease of operation, electronic instrumentation for faster response in process operation, miniature receivers to reduce panel board space and fit into graphic panels, and finally the latest development in process control instrumentation—continuous stream analysis.

Heretofore, an operator determined the efficiency of his processing operations by sending a sample of the final product to a centrally located control laboratory where analyses were made by trained chemists. Any delay kept the operator in the dark that much longer as to precisely what degree of quality he was obtaining in the product. Delays sometimes ranged from hours to weeks.

The first attempt to provide a continuous type of analysis was made by packaging existing laboratory

* Mr. Fraade is supervisor, application engineering, analytical and control instruments division, at Consolidated Electrodynamics Corp.

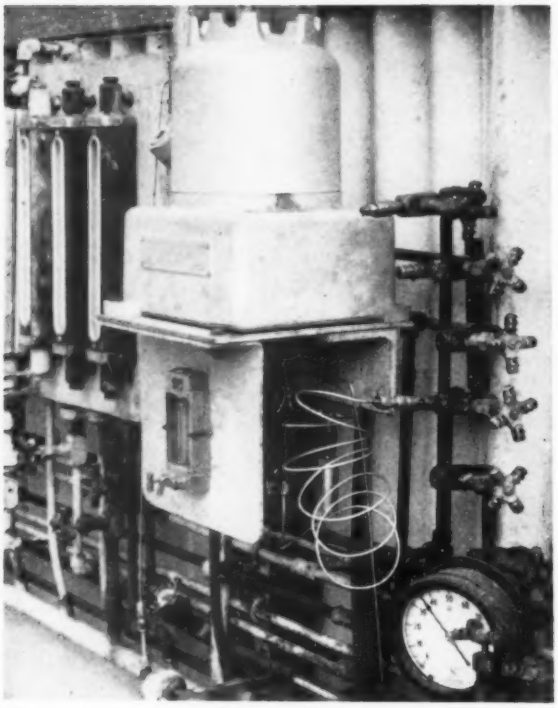


Fig. 2. Moisture analyzer installed in explosion-proof housing.

instruments so that they could be used in plant areas. These instruments were put into rugged cabinets, and were made explosion-proof to meet Underwriter's Laboratory requirements.

As use of these analytical instruments in plants became more widely accepted, instrument manufacturers directed their efforts toward a true process-design concept for their equipment. As a result, true process plant instrumentation which will monitor end product quality is available.

The big push for such instrumentation came from large refinery operations. However, smaller operations such as natural gasoline recovery and natural gas processing soon saw the same benefits.

The following will describe some of the more commonly used types of continuous process stream analyzers applicable to the natural gas industry.

• Moisture monitoring equipment

This type of analyzer provides continuous detection of moisture in gas streams at the part-per-million level. A major consideration in treating and pipelining natural gas is a dryness specification.

Dehydration units are an integral part of gas processing. Moisture detection plays a prominent role in controlling residue gas streams, and for supplying data to assure properly controlled dehydration units. Monitoring of the moisture content is of prime importance in order that other control systems adjuncts may be utilized. *Fig. 1* shows a portable moisture analyzer in use on a gas pipeline. Where required, this instrument also is available in explosion-proof housing in accordance with Underwriters' specifications for use in hazardous atmospheres *(see Fig. 2)*.

A moisture monitor continuously looks at a sample stream taken from the dehydrator outlet. For a completely automated approach it can automatically switch the gas flow stream from operating to standby drying towers should the analytical results indicate that the drying operation is faulty.

Another application is monitoring residue gas from absorbing operations where residue gas is being sent to pipeline for subsequent deliveries to resale points. This gas must be kept below the dew point of the hydrocarbon constituents to prevent the formation of hydrates. Presence of hydrates can cause obstruction in fittings, pipelines, valves and other mechanical equipment.

When the hydrate plug becomes a complete obstruction in the valve body or line, the pressure drops to the point where line efficiency rapidly approaches zero, and compressors and pumps are severely overworked. All equipment must be shut down.

Many methods of measuring water vapor have been applied with varying degrees of success, depending upon requirements of the application. Hair hygrometers and wet and dry bulb thermometers are familiar instruments for determining moisture at levels found in the atmosphere. Electrical conductivity of hydroscopic liquids and salts, and the measurement of dew point have also been used for determining low concentrations of water vapor in gases.

However, these methods are not advantageous for continuous process measurement and control applications in the part-per-million range. The one method

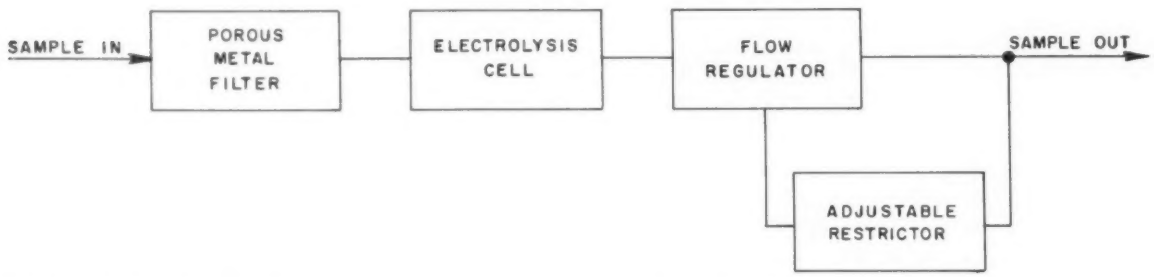


Fig. 3. Schematic of sample flow for continuous process measurement and control applications in the part-per-million range.

suited for this approach is equally adaptable to both laboratory or process plant use. *Fig. 3* is a schematic of the sample flow. Detection is accomplished by continuously and quantitatively absorbing and electrolyzing all water present in the sample stream entering the instrument. Electrolysis current, directly related by Faraday's law to mass rate-of-flow of moisture into the instrument, is used as the indication of water content. Flow is kept constant. The indicated current for electrolysis, then, is proportional only to water concentration, conveniently expressed in parts per million.

• The Titrilog

Another application of a stream analyzer is for trace determination of sulfur compounds in natural gas, both at the wellhead and after it has passed through treating facilities.

Fig. 4 shows Consolidated Electrodynamics Corp.'s Type 26-103 Titrilog. This instrument is widely used for determination of mercaptans or H_2S in both natural gas wells in the field, and as a monitor for efficiency of removal operations.

Natural gas from sour fields is treated near the source to remove hydrogen sulfide. The contract limit on such gas sold to pipelines is generally 0.25 grains H_2S per hundred cu ft, whereas raw gas may contain up to several thousand grains. Failure or inefficiency of a treating plant may result in contamination of large volumes of gas in a pipeline.

Monitoring treated gas will give a continuous record of sulfur concentration. This instrument will promptly alarm when there is a plant upset, enabling operators to take corrective measures, and divert sour gas from main transmission lines. When correction is made, the Titrilog immediately indicates this fact, avoiding needless venting of gas. In natural gas applications the Titrilog will give individual recordings of hydrogen sulfide, mercaptans, and residual organic sulfic compounds.

The initial detection of mercaptan and sulfur compounds has a great effect on the extent and size of treating to process natural gas and remove these compounds. One company planning transmission of west Texas natural gas calculated that extra large treating facilities probably would be necessary to remove 30 per cent CO_2, along with sulfur, because of very tight specifications set up by its customers. A Titrilog survey indicated that the existing treating facilities would be adequate, and the planned expansion of some million dollars worth of treating facilities was not necessary.

Another application for trace amounts of sulfur analysis is in odorization of natural gas. Accurate control of the addition of odorant can be achieved by use of a Titrilog. Thus, it can be determined if a sufficient amount of odorant is being added for safe operation. A permanent, continuous record of odorant concentration is provided.

The Titrilog is being used to monitor odorant concentrations of gas lines, and sound an alarm when excessive concentrations are present. This results in the elimination of costly unnecessary service calls and in economical use of odorant.

Fig. 4. Portable Titrilog in use to check odorant concentration in a distribution system.

The portable Titrilog is particularly useful for evaluating an individual odorant in a gas distribution system. Diffusion, condensation, absorption, and oxidation of the odorant in a particular system can be studied in continuous detail at various points throughout the system. A similar application is in odorization of liquefied petroleum gas.

One user of a Titrilog for odorant monitoring reported it was common to receive several hundred additional reported leaks from customers during a relatively short period of time, due to over-odorization by a supplier. This same user reports that since the installation of his sulfur "sniffer," there has been only one occasion during which an excessive number of leaks has been attributed to too much odorant. On this occasion, his analytical instrument positively reported this condition by reading out on the recorder/receiver that the odor level was too high.

A classic application of a sulfur analysis can be made on the moving of natural gas from the field, through the treating plant, through the pipeline and on into distribution systems. On transmission lines, the Titrilog makes a continuous record of individual concentrations of both odorant and hydrogen sulfide. Where sour gas enters a pipeline, the Titrilog shows the exact start and ending of the sour portion.

Sulfur analysis is often used in the amine contactor process operation. This tower is used to remove both H_2S and CO from natural gas. Incoming sour gas contacts an aqueous solution of MEA. The sweetened gas comes out of the amine contactors, then goes to a hydrocarbon recovery plant. On the sweet gas outlet, a Titrilog will indicate if gas out of the amine contactors has an H_2S content in excess of that specified by the pipeline. If this occurs, the operator can check the pressure drop across each contactor to see whether the towers have flooded, and also check the flow record on the amine to each contactor to see if any of the pumps has failed. ■

(Next month the author will describe the applications of gas chromotography and the mass spectrometer.)

Conducting a comprehensive service training program

By H. C. FOOTE, Customer Service Training Supervisor
Southern California Gas Co., Los Angeles

This article covers the overall customer service training program of one of the nation's largest distribution companies. It explains the reasons for the courses, and offers some concrete training advice to utilities of all sizes. Next month, GAS will resume its specialized training series with an article on Lone Star Gas Co.'s training program for gas air conditioning equipment.

SOUTHERN CALIFORNIA GAS CO. serves 1,647,118 meters with a gain of about 50,000 meters each year. Consequently, our training program for customer servicemen is also rather large. During the past five years 1123 servicemen have been given either a 20-day basic or a 20-day advanced training course. Our service area is divided into 11 operating divisions, stretching from central California to the Mexican border. Each of these divisions has from one to several district service bases. We have about 750 servicemen working at 28 district bases located strategically throughout the area served by the company.

These servicemen fall into four classifications: 20 per cent are Servicemen #2 who are the new service employees in the department; 70 per cent Servicemen #1, the backbone of our service force; 4 per cent commercial servicemen who service restaurant-type equipment; and 6 per cent parts truck servicemen who install new parts in various gas appliances. In addition, there are 21 air conditioning and industrial servicemen serving the area, who are trained by our industrial service section.

The duties of a training section fall into two broad categories: The training of new servicemen to meet the manpower requirements of the service bases, and the preparation of service information and procedures required to keep the established servicemen up to date.

There are two basic methods of training new servicemen. One method is to give the new man training in the field by having him assist an established serviceman for several months or even a year or more. None of us is perfect. Therefore, the new man will likely pick up a few poor work habits from the established serviceman, which added to his own imperfections will give him more than his share *(Fig. 1)*. He in turn may instruct a new man at some future

will it be this?

Fig. 1.

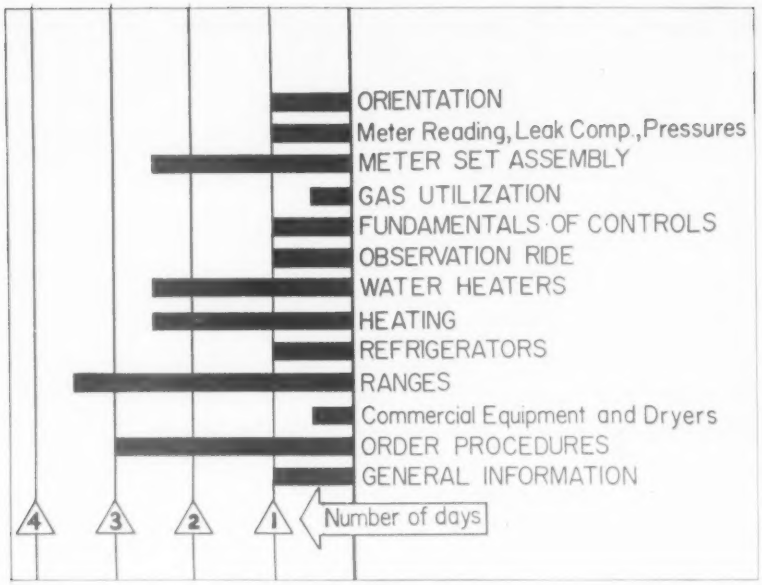


Fig. 3. Here is how Servicemen #2 spend their days in classroom training.

date, and we could end up in a vicious cycle of downgrading our service work.

• **Classroom training**

The second basic method of training a serviceman is to provide classroom training at the beginning of his employment *(Fig. 2)*. This is the method we use. It enables the serviceman to receive his training from a competent instructor who has proved his talents in service work and has the ability to teach. All of our instructors are former servicemen with outstanding records who were selected as quality control service inspectors and gained additional experience in at least one other staff position.

In the classroom the student has an opportunity to study all phases of the work in an organized manner. If he had to pick up this information by field experience in unorganized bits here and there, it could take years before he ran into many of the service problems.

or will it be this?

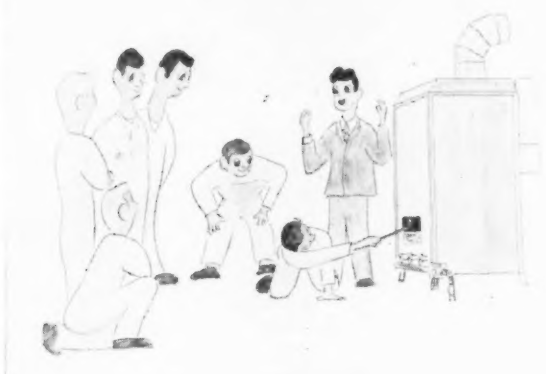


Fig. 2.

Classroom training can be conducted in one location, where training facilities and standard instructions foster uniformity in work procedures throughout the company's system. A high production of work assignments, along with a good quality of workmanship, is accomplished in a short period of time. After one month of field work, a new serviceman with no previous experience is able to complete a full day's basic assignment working by himself.

Perhaps most important of all, the student is evaluated by close personal supervision against a basic set of performance standards which have been determined by years of experience. If he does not measure up to the minimum standards during the classroom phase, he is dropped from the course. This not only keeps the quality of service personnel high but also saves many hours of the field supervisor's time.

We feel this system of training is effective and saves considerable time and expense, while maintaining high quality service.

It takes about one calendar month or 20 working days for the classroom training of a new Serviceman #2 *(Fig. 3)*. His duties are primarily to turn on gas for new customers, to replace old age or defective meters, to restore gas service which has been interrupted by accident or for company work, and to close the gas meter for customers who are moving away.

A prospective employee is given two written tests: one general knowledge test and one temperament test. He must also meet specific educational and physical requirements. If he completes these requirements successfully, he is interviewed by a district service supervisor who makes the final decision on whether he should be employed.

When he reports for training, he is welcomed to the gas company by the training supervisor and is congratulated on having been selected to work in the

customer service department. He reports to the storeroom for his tools and coveralls, and is ready to get down to the serious business of learning to be a serviceman. He is informed that he will be "Mr. Gas Company" to most of our customers and of the importance of his job know-how.

We feel that a serviceman should know something about the product which his company sells. He should be able to answer questions from the customers, such as: "What is natural gas?" "Where do we get it?" "What processing must it go through before we can use it?" and other questions of this type. Students are instructed on the essential facts about natural gas to enable them to answer questions intelligently.

It is our policy to provide safe and satisfactory service for our customers. Customers' houselines must be leak-free and are checked by the serviceman each time he turns on the gas meter. Satisfactory service requires proper gas pressures in the home. Servicemen are trained to take pressure and adjust the pressure regulator as necessary.

The instructor introduces the subject of meter reading with the aid of a large meter index prop. A handle at the rear of the prop can be turned to simulate the actual movement of a meter index. Each student is given an actual meter index for practice reading. There are meter reading problems on each of the written tests.

Serviceman #2 must know how to build a meter set assembly from the service riser to the customer's houseline although he does not normally perform this function. Meter set assemblies are normally built by the distribution department, but if the employee arrives at the customer's premises with a turn-on order and a meter set assembly is not installed, he will build one and set the meter when the customer requests immediate gas service. He is shown how to turn on meters, close meters and to change old-age meters, and then is given the opportunity of practicing on the various types of meter sets in the classroom. During manipulation in the MSA room, natural gas is not used for safety reasons. Compressed air with an odorant is used, but the student does not know this and observes the necessary safety precautions.

Why does it take 20 days of classroom training to teach a man to perform the duties of a Serviceman #2? It is our policy to light, inspect and adjust all the gas appliances in the home at the time of the turn-on. Consequently, our serviceman must become acquainted with the hundreds of gas controls and appliances which have been produced over a period of many years. He must be able to recognize good flame characteristics and adjust burners within a required tolerance which will insure proper combustion and performance.

The explanation of gas-air burner adjustment is demonstrated early in the course, and students perform actual manipulations while the lecture material is being presented. Ten hotplates with double burners were modified by the training staff so they could be easily manipulated to show the desired results of various adjustments.

Early in the course the student serviceman reports to a district service base and rides for one day with an established Serviceman #2. We find the time spent is very valuable in letting the student know what will be expected of him in his new work. Experience gained from this ride provides excellent background for the remainder of the course.

The training facilities at our training section include a classroom for each major type of gas appliance. The water heater room has water heaters installed to operate as the student would find them in the customers' homes. They vary in age and design from the outmoded manually operated to the instantaneous and storage types. In the water heater room the student learns the basic fundamentals of the bimetal, rod and tube, and thermomagnetic automatic controls. He learns to lubricate or adjust all but the most complicated valves and thermostats. He is taught the principle of gas venting and learns to recognize venting problems. Training props, which can be connected to a gas supply and operated as they would on a gas appliance, are constructed by our training staff *(Fig. 4)*. Students had difficulty in understanding "pressure drop" in gas pipelines, so a prop was designed to demonstrate this action *(Fig. 5)*. These props enable the student to gain practical experience in servicing procedures.

Because we have many types of room heaters being used by our customers, extensive training is necessary to enable our servicemen to recognize those which are poorly designed and are potentially hazardous. Every serviceman is also given ample opportunity to service all types of gravity and forced air furnaces.

Thousands of forced air furnaces have been installed inside small closets in southern California. In some instances in order to cut costs or through ignorance, builders have made substandard installations. These have resulted in poor performance and possible circulation of combustion products in the living areas of our customers' homes. In order to teach our new servicemen to recognize these substandard installations, an outline was written and supplemented with 35mm color slides illustrating various types of installations.

A specially designed, portable closet containing a forced air furnace enables the instructor to give an actual demonstration of proper and improper installations *(Fig. 6)*. Designed and built by the classroom training staff members, the prop has baffles, dampers, and openings which can be manipulated to illustrate lecture material. By injecting smoke into various openings, the instructor can show paths of fresh air, combustion products and circulating air *(Fig. 7)*.

In the refrigerator room an instructor demonstrates how we get cold from heat on a cut-away refrigeration unit. Servicemen #2 are expected to light and adjust air input of burners, check for a good door seal, and adjust the door latch, if necessary. They explain the proper operation of the refrigerator to the customer. Practical experience is gained by servicing the many refrigerators located around the refrigerator room.

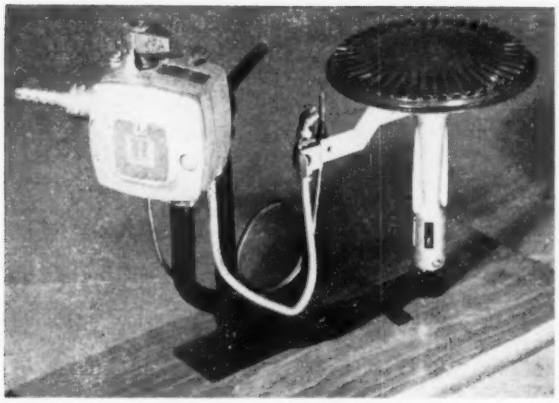


Fig. 4. Training props are connected to a gas supply and operate as they would on a gas appliance.

At least 3½ days of the 20-day course are spent in the range room. The range is generally the appliance nearest and dearest to the housewife's heart because she uses it every day, and her prestige as a cook depends on its performing properly. The serviceman is expected to adjust all burners, lubricate hard-to-turn burner valves, tighten loose hardware, and order parts desired by the customer. His training includes service to commercial-type equipment used in restaurants.

For the new servicemen, service is limited on clothes dryers to gas-air burner adjustments, simple automatic pilot adjustments, and instruction on the operation of the appliance to the customer.

At regular intervals in the training course, the students work practice orders in a room outfitted with appliances generally found in the customer's home. A student is selected to be the serviceman and the instructor takes the part of a customer. The remainder of the class observes and makes notes of constructive criticism to be discussed when the order is finished.

How do we know how a student is progressing?

1. We observe his performance in the classroom and on the practice orders.
2. Eleven written tests are evaluated as each phase of the course is completed.
3. Weekly report forms are filled out by the instructors noting his interest in the course, application of the course material, mechanical know-how, and ability to fill out the various forms necessary in service work. The instructor offers suggestions for improvement and gives his opinion on the student's potential as a serviceman.

Every student is interviewed by the training supervisor midway in the course. He is informed of his progress and is offered constructive suggestions for improvement, if such are needed.

• Field training

Those students who successfully complete the classroom phase of the training course graduate to field training. The student at this time is a diamond in the rough and needs practical experience in field work. He is assigned to work with an instructor for two weeks. A small service base was set up at our training section about two years ago. A field training supervisor and several instructors are assigned to this base. Its purpose is to relieve the field supervisors of some of their training burden.

The student is given 50 per cent of a normal day's work for his first two weeks of field training. He is encouraged to complete as much of the work as he can by himself, relying upon the instructor only when necessary. He quickly picks up a good work routine and has little difficulty in completing his assignment. If his work proves satisfactory during this two-week period, he then reports to his district service base. He is given 75 per cent of a normal day's work at this time, and at the end of two weeks is given the same amount of work normally assigned an established serviceman.

When the students enrolled in a class outnumber available instructors at the training base, it is necessary to send some students directly to their district service bases from the classroom. In this event a service supervisor performs the training supervision for one week or more as deemed necessary. The new Serviceman #2 is then on his own with only an occasional ride with his supervisor for instruction.

How effective has his classroom and field training

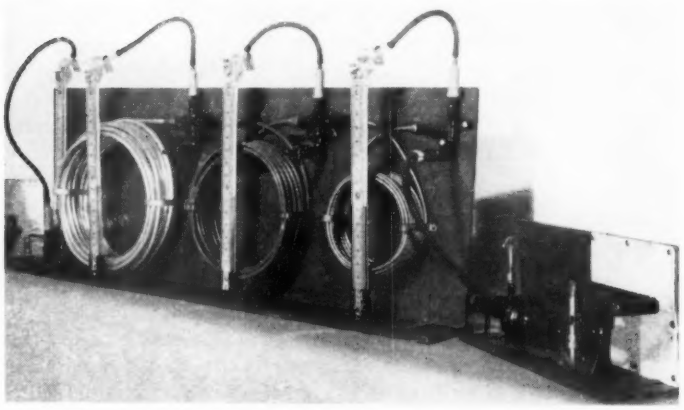


Fig. 5. Training staff designed a prop to demonstrate pressure drop in gas lines to Servicemen #2.

been? Can he, after 30 days of supervised classroom and field training, work by himself and do a good job? Our experience has been that he can do almost as well as an established Serviceman #2. The quality of his work is almost par with that of the older servicemen, and the amount of work accomplished, while low at first, rapidly increases.

About 20 per cent of the students enrolled in the course fail to qualify as servicemen. During 1958 we enrolled 133 Servicemen #2 and 108 of them completed the course successfully. Of the 25 who did not graduate, 11 did not make satisfactory progress in the classroom and seven resigned for personal reasons. Seven were disqualified in field training for lack of mechanical ability, or unsatisfactory application of the course material.

• More complicated assignments

The Serviceman #1 training course is designed to train qualified Servicemen #2 in the more complicated appliance adjustments and customer complaint orders. This course also consists of 20 days of classroom training. It includes one day on the fundamentals of electricity, 16 days of appliance servicing and 3 days of order procedure. Instructions are given on the proper completion of poor pressure, leak and high bill orders, as well as orders involving calibration and disassembly of various appliance controls.

Two instructors specialize in the more technical appliance parts installation and commercial appliance service work. They provide field assistance to all service bases at the request of the Service Supervisors.

A two-day course is given to new commercial servicemen. The students learn commercial appliance policy and service procedures and get instruction and practice on parts replacement. Sufficient commercial appliances are available for practical servicing experience on equipment they will normally find in restaurants. A field trip is conducted through one of the commercial appliance manufacturing plants to enlighten the students on the assembly of the component parts of the appliances.

New parts truck servicemen are given eight days of classroom training which consists of two days on ranges, two days on refrigerators, and four days on dryers and washer-dryer combinations. Due to the technical nature of the washer-dryer combinations, we find that frequent field assistance and instruction are necessary.

A training program can be more effective when the results can be properly evaluated. Our quality control service inspectors check a small percentage of orders worked by all servicemen. The first report received on a new serviceman is sent to the training section. This report, along with the reports of others in his training class, is evaluated to see if there is a trend indicating that certain phases of the course were not stressed properly. We find these reports to be a valuable tool in keeping our training program in proper balance. We feel it is also important that classroom instructors spend part of each year in the field training of new servicemen and in working service orders to stay close to actual field conditions.

Our training section also holds special training classes as needed. Each year we train people from various departments of the company in emergency restore service procedure. In the event of a major outage, we can call on over 1000 of these employees who are trained sufficiently in service work to shut down and then re-establish the gas service to our customers. These men, coupled with our regular service force, would enable us to meet the manpower requirements of most emergencies.

In order to improve the service to our customers, certain distribution department employees were given training on turn-on procedure. This training enables them to establish service to the premises when requested to do so by the customer at the time of building the meter set assembly, and to light and make any necessary minor adjustments to the gas appliances. Regular servicemen follow up and adjust all appliances later in the day.

The training of servicemen does not end with classroom and field instruction. We must prepare service information, visual aids and props, which are necessary to keep our service force informed.

We provide each serviceman with six service manuals. These manuals include the three AGA gas appliance service manuals, our customer service field manual, our heating manual and parts manual. In order to be used effectively they must be up to date. Complete new sections, such as gas light servicing procedures, are developed by the training staff and added as necessary.

• Special controls manual

Did you ever get a question about a gas control and have a parade of controls flit through your mind without pinning down the one in question? Our new appliance controls manual was developed to assist field people in the positive identification of controls. In this, each page contains a large picture of the control, listed alphabetically by the manufacturer's name; the model number, and key service hints. We have over 90 per cent of these controls as working props, which are identified by a number at the bottom of the page. If a field supervisor would like to borrow a particular prop, he can order it by number from the training section. We loan out about 400 props each year to district supervisors for training purposes.

We must have a good channel of communications between the training staff and the producers of gas appliances and controls. We accomplish this through the employee suggestion and field observation group in the training section. Because the manufacturer is as interested as we are in keeping the customer happy, cooperation has been excellent. From the servicemen's comments on the field observation form, suggestions are offered for the improvement of the appliances or controls. The manufacturer in turn supplies us with advance information on new appliances and controls which will often enable us to place service information in the hands of our serviceman before he runs into a service problem on the equip-

Fig. 6. A portable closet with a forced air furnace in it is used to demonstrate proper and improper installations.

ment. This information is generally sent out as a news letter and contains a picture and general information about the new product. New products are often brought to our training section, and factory representatives discuss service procedure with our training staff. District service supervisors and their assistants are then invited to a meeting at the training section, and the information is passed along to them.

We feel the most effective training of the established servicemen is accomplished at their service bases by their own service supervisors. It is the duty of the training section to make this job as easy as possible for these supervisors by placing in their hands well prepared training outlines along with suitable visual aids and props.

• Special training packages

During the past two years we have prepared several special training packages, with this thought in mind. Each package consists of an outline, a set of 35mm color slides and a projector. The outlines are prepared to enable the supervisor to use his own words and place emphasis wherever his particular service situation warrants it. The slides supplement the lecture and add understanding and interest to the program. Some of the subjects treated are: "Poor Housekeeping Is for the Birds," "Turn-on Procedure," "Read or Verify Procedure," and "Defensive Driving." There are about 60 slides for each of these subjects, and if the comments received from the servicemen and the supervisors indicate their effectiveness, everyone is well pleased with this training method. These same training packages have been integrated into the classroom training program for new servicemen.

Is it practical for smaller companies with limited training facilities to have this type of a training package? We believe that it is. Minimum requirements are a 35mm camera and an instructor with a keen eye.

There have been many technical advances in appliances and controls these past few years and we anticipate many more in the future. Because of these changes, we recognize our responsibility in seeking improved training techniques to provide our servicemen with the information they need to accomplish their tasks.

To summarize, we feel that a good training program should include:

1. Classroom training for the new men.
2. Competent instructors with field experience.
3. A well-organized training outline.
4. Adequate visual aids and props.
5. Appliances and controls for student manipulation.
6. Up-to-date servicing instructions and manuals.
7. Visual aids and well prepared outlines to make the field supervisor's training job easier.
8. A method of checking servicemen's work to keep the training program in proper balance. ■

Fig. 7. Instructor injects smoke into various openings in closet-enclosed forced air furnace to show paths of fresh air, combustion products and circulating air.

This article has been adapted from a paper presented by the author at the Pacific Coast Gas Association Customer Service Conference in Phoenix, Ariz., April 21-23, 1959.

True mass flowmeter measures fluids directly in pounds

Field testing BS&B's production prototype of the mass flowmeter.

THE long search for a practical instrument to directly measure gas and liquid flow in pounds has resulted in the development of a "true mass" flowmeter, according to a joint announcement by Black, Sivalls & Bryson Inc. and General Electric Co.

The simple, low-maintenance device precisely measures the weight of flowing fluids with high accuracy over wide ranges of flow rate, pressure, temperature and density. It does this without additional measurements and corrections for these variables, the two companies revealed.

First production units are expected to be available early in 1960. Prototype production units will be field tested in various natural gas services throughout the balance of this year, according to BS&B president Kenneth W. Lineberry. Marketing in the petroleum and natural gas industries will be handled by BS&B, who cooperated with General Electric in the development of the meter and handled the proving out of the instrument for measurement of natural gas.

"A broad range of application is found for the meter in the natural gas industry—at the wellhead, and in pipeline gathering, gas transmission and pipeline distribution systems," Mr. Lineberry pointed out. "The mass flowmeter will provide the industry with a means for absolute flow measurement with sustained high accuracy. It will reduce the expense involved in the computing operations required in measurement by volume."

Elaborating on the importance of the new flowmeter, Edwin E. Parker, general manager of G-E's instruments department, stated that the pound is a fundamental fluid measurement used by many industries as a basis for figuring costs, regulating blending operations, measuring yields, determining energy of Btu content or metering bulk loading operations. However, up to now, commonly used methods of determining fluid flow by mass have first required a measurement of fluid volume. This volume must either be manually or automatically corrected for such variables as fluid temperature, pressure or density. The manual methods are cumbersome, time-consuming and leave room for human error, Mr. Parker said. "Automatic correction systems are relatively complex and present additional maintenance problems."

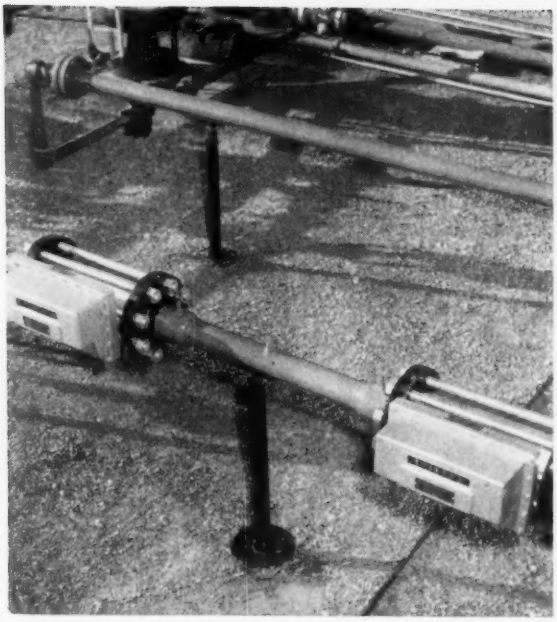
In contrast, the flowmeter—sensing mass directly—requires no in-between calculations, is completely self-contained, light in weight, and is designed for long maintenance-free operation. This inherent simplicity and the sustained accuracy (less than plus or minus 1 per cent of reading) of the flowmeter under variable conditions, makes the instrument ideal for flow measurement applications, Mr. Parker said.

The flowmeter is compatible with automation, being designed to emit a series of electrical pulses, each representing a given weight of flow. This signal is designed to operate remote recording, dispatching and accounting systems.

Mr. Lineberry said BS&B has designed and placed in operation a "prover" facility especially designed for precision calibration of the mass flowmeter. The company installed the prover at its Oklahoma City development laboratory last year. President Lineberry explained that primary standards for the measurement of high-pressure gases on a mass basis had not previously been available.

The BS&B prover consists essentially of a gas stor-

Calibration run—shown is the control room, with platform balance, mass flowmeter, calibration and control instruments.



Repeatability testing of the mass flowmeter in the company's development laboratory.

age vessel for pressures as high as 3000 psi. The gas is weighed to a high degree of accuracy and discharged through the flowmeter at controlled pressures and flow rates. By weighing the vessel before, during, and after the test, the weight rate of flow through the meter is determined.

The flowmeter will measure many industrial fluids in addition to natural gas—naphtha, gasoline, liquefied petroleum gases, and other hydrocarbon liquids, refinery gas, oxygen, nitrogen, etc. Looking beyond present uses, G-E is continuing development work to adapt the mass flowmeter to measurement of other gases and liquids. These are expected to include light gases such as hydrogen and helium as well as high temperature, corrosive and cryogenic fluids—steam, acids and liquid oxygen, for example.

Several basic contributions to flowmeter technology are incorporated in the instrument. One is a small gyroscope which directly and automatically totalizes flow in a novel manner. Another is a flow-rate sensor, common to flowmeters produced by General Electric since 1953, for measuring aircraft fuel consumption. It consists of a constant speed impeller and a stationary turbine arranged for axial flow. The impeller gives a twist to the fluid stream and the fixed turbine straightens the stream. The amount of torque exerted on the turbine when removing the twist is proportional to the mass rate of flow. The gyro integrates this torque with respect to time. Output is continuously summed up on a cyclometer dial in pounds.

A marked advantage of this sensing and integrating system is its ability to operate from an unregulated power supply without any measurable effect on meter accuracy. ■

Gas weighing system for the mass flowmeter. Shown are the spherical air tanks on platform balance with controls and exhaust noise suppressors.

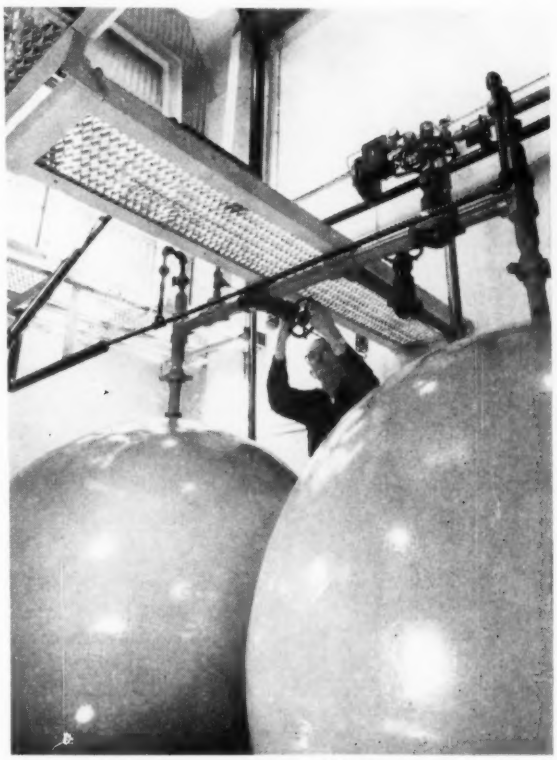


Fig. 1. Gas luau torches light Los Angeles County Arboretum in Arcadia, Calif.

knot of resinous wood, and later the kerosene-fueled burner used to illuminate an outdoor setting or function. The flickering yellow flame produces a particularly pleasing effect.

The natural gas adaptation of this is essentially an orifice at the top of a vertical pipe extending a suitable height above the ground, from which a yellow non-aerated gas flame burns to a height of about 18 in. The assembly at the top of the pipe is built so that it has an attractive appearance and also somewhat simulates the earlier knot of wood or kerosene receptacle. It is also designed so that it will resist extinguishment by wind velocities up to 16 miles per hour. A natural gas flame of about 18 in. in height requires 14.5 cu ft per hour and is produced by a No. 53 (1/16-in.) orifice with an upstream pressure of 8 in. water column. The height of 18 in. is selected because it more or less duplicates the flame produced by other types of luau torches, and is the maximum flame height permitted by one local fire department for outdoor unshielded flames.

The first installation of these gas luau torches where they could be viewed by the public was at the Los Angeles County Arboretum in Arcadia, Calif. The interest is indicated by the number of inquiries that are being received. *Fig. 1* is a photograph of the installation at the Arboretum.

The flame burning on the surface of a pond or pool of water, while not quite so utilitarian as the luau torch, produces an even more decorative effect. It is also non-aerated and yellow, and the effect is enhanced if the flame or flames burn quietly or lazily without spurting too high and churning the water, and appear to flicker back and forth across the surface. This movement or flickering is actually

'Decorative' gas finds more outlets

By GUY CORFIELD, Technical Editor

GAS lights—so much in use at the turn of the century—are recalled with affection and nostalgia by those who can remember them. It is interesting to note the comeback that is being staged by gas lighting, which is not only affording excellent publicity for gas but also is adding a significant consumption load.

Two other developments in what might be termed gas lighting are gathering impetus, and re-creating the charm of the old non-aerated yellow gas flame. One is the gas luau torch (*Fig. 1*) that has come to use across the Pacific from Hawaii, and the other is a gas flame burning on the surface of a decorative pool or pond of water (*Fig. 2*).

The gas luau torch is a modernization of the

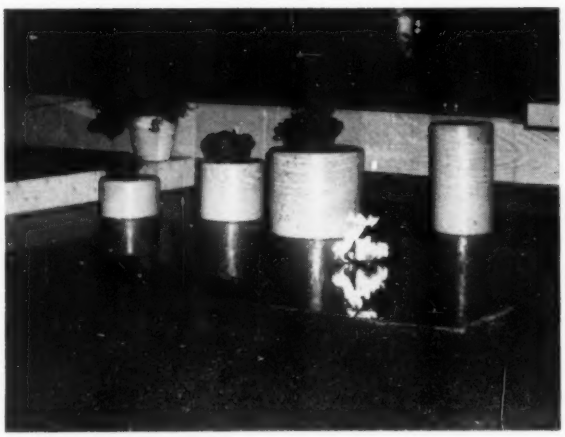


Fig. 2. Water picks up reflection of gas flame burning on surface of a decorative pool or pond.

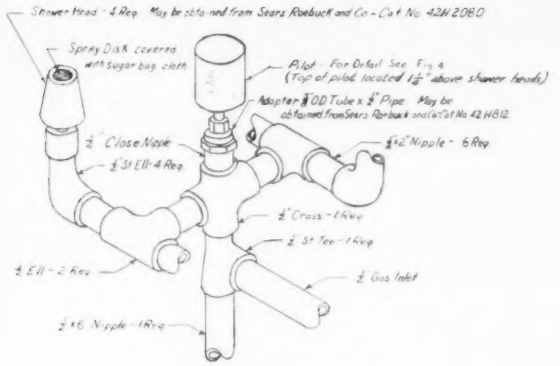

Shower Head - 4 Req. May be obtained from Sears Roebuck and Co - Cat No. 42H 2080
Spray Disk covered with sugar bag cloth
Pilot - For Detail See Fig. 4 (Top of pilot located 1½" above shower heads)
Adapter ¾ OD Tube x ¾" Pipe. May be obtained from Sears Roebuck and Co Cat No. 42 H812
½" Close Nipple
½" St Ell - 4 Req.
½ x 2" Nipple - 6 Req.
½" Cross - 1 Req.
½" St Tee - 1 Req.
½" Ell - 2 Req.
½" Gas Inlet
½ x 6 Nipple - 1 Req.

Fig. 3. Burner assembly.

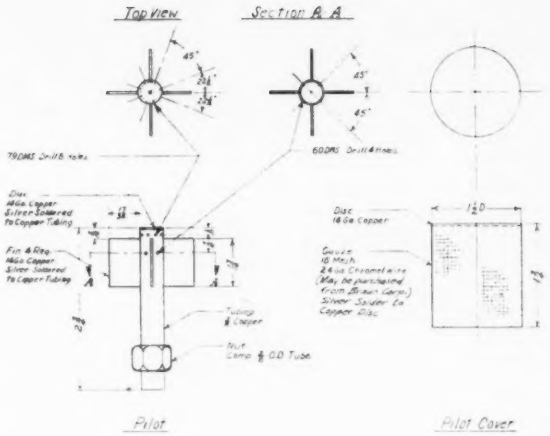

TOP VIEW
SECTION A-A
45°
60 DRS Drill 4 Holes
Disc 16 Ga Copper
Gauze 16 Mesh 24 ga Chromel wire (May be purchased from Sears Cera.)
Silver Solder to Copper Disc
Fin 6 Req. 16 Ga Copper Silver Soldered to Copper Tubing
Tubing ¾ Copper
Nut Cama ¾ OD Tube
Pilot
Pilot Cover

Fig. 4. Detail of pilot construction.

produced by periodic ignition and extinguishment of small areas of the gas bubbles as they leave the surface of the water. And to be sure that the flame does not extinguish completely but is always burning in some portion of the area over which the bubbles are rising, a "non-extinguishable" pilot, which projects ¾ in. out of the water in the approximate center of the area, is an important part of the assembly. It is also important, of course, that the water level in the pond remain constant, and this can be realized by a small water flow into the pond and a fixed level overflow.

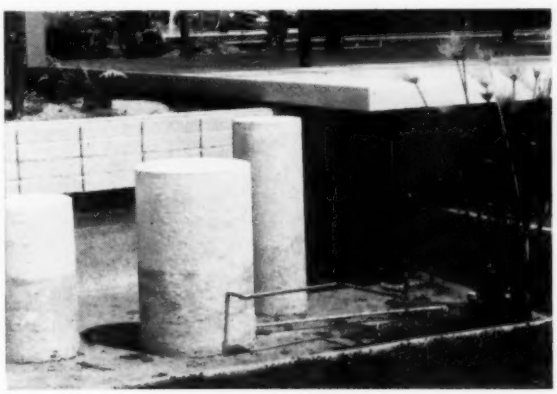
An installation of this water surface burner has also been made at the Los Angeles County Arboretum. It also has attracted considerable attention and requests for installation details. *Fig. 3* shows the burner assembly. *Fig. 4* is a detail of the pilot construction. *Fig. 5* shows the assembly installed in the pond, while *Fig. 6* is a general view of the pond before filling with water. A section of the gas supply line is installed inside one of the concrete cylinders in the pond (see *Fig. 6*) with a loop extending above the water level to prevent the water from backing up into the gas line. *Fig. 2* shows the night-time effect.

This concept or effect of gas burning on the surface of water is by no means new. An installation at the Luau restaurant in North Miami, Fla., has been in operation for several years. Another installation can be seen in the front of the Luau restaurant in Beverly Hills, Calif. There are no doubt others.

The installation that has been made recently at the Arboretum in Arcadia is perhaps different only in that it is somewhat successful in producing the effect of a yellow flickering flame with a relatively low consumption of 30 cu ft of natural gas per hour for a flame circle of about 36 in. in diameter, and using a pilot that will resist extinguishment by wind velocities up to 6 miles per hour. The assembly operates at 8 in. water column supply pressure. It was developed in the utilization laboratory of Southern California and Southern Counties Gas companies of California. ■

Fig. 5. Assembly installed in pond.

Fig. 6. Pond before filling with water. Burner assembly is to the right of concrete cylinders.



regulatory • *Cont'd.*

from page 12

am not going into these details because this audience, with an intimate knowledge of the use patterns of coal, oil, and gas in the past, and supplied with ample statistics on the subject through the National Coal Association, is not in need of such statistics from me. Recently coal has been accounting for about 70 per cent of all thermal generation, and this appears to be a likely pattern for 1980. Thus, it is concluded that of the 1.4 trillion kilowatt-hours to be produced by conventional fuels, about 1 trillion probably will be generated by coal. Converting this into the amount of coal which will be needed for electric power production in 1980, we arrive at the very substantial figure of 400 million tons. This is for electric utility plants only. Add your own figure for generating plants of industrial establishments —it may be as much as 70 million tons—and you will realize that electric power production is going to have a tremendous impact on the coal industry during the next two decades." ■

corrosion • *Continued*

from page 23

new line was to be built, and the coating specifications to be used were the same as those on some existing lines. Consequently, it was assumed that the current requirements would be estimated with sufficient precision from the existing installations, so the cathodic protection system was designed before construction. Installation proceeded according to the design, without any test.

Today this company has three 40-ampere rectifiers installed on this line, each delivering less than 5 amperes. The current demand is so low that the lowest tap on the unit is too low, so each of them has a series resistor to limit the current output! A current requirement test is strongly recommended for any buried structure, unless you are prepared to meet the problem by gross over-design. ■

Washington • *Cont'd.*

from page 21

well be muddled further.

From the gas producer point of view—and even from the distributor end, where the legal and regulatory confusion still appears a tangled maze—the present situation again points up the need for clarifying legislation. For instance, the Harris bill, which has been written off by its sponsors and has little interest among the gas industry, would solve the problem of initial prices, escalation, and replace cost-of-service with market value.

If Zwerdling's decision becomes the yardstick for producer regulation, it will affect some 3000 independent producers. At present, there are some 2100 requests from independent producers for rate increases totaling $92 million a year pending. Presumably, these requests would have to be cut back.

FPC spokesmen expect it will be some time before the full commission goes over in detail the Zwerdling decision, the exceptions filed by Phillips and other producers, holds a few days of oral arguments, and produces its own ruling upholding, upsetting, or modifying the decision.

There is little doubt that whatever the FPC does will go to the courts for another series of reviews. So it probably will still be a good many months, or even years, before the Phillips case finally sets its precedents.

This expected timetable looks like what has gone in the past. The case came before the FPC in 1948. Almost three years later, in 1951, the full commission finally decided it lacked jurisdiction. Then it went through the courts, winding up with a 1954 U. S. Supreme Court decision upholding lower courts and forcing the FPC to take jurisdiction. Zwerdling, who joined the FPC five years ago, took over the case as hearing examiner in 1956, and has since collected 10,000 pages of transcript and 235 exhibits — and probably a few gray hairs as well.

CANADA'S natural gas industry is beginning to follow paths blazed by its U. S. counterpart, 25 years

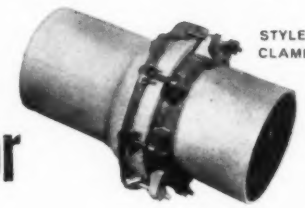
There is a Dresser®

STYLE 38 6-BOLT COUPLING

pipe coupling, fitting,

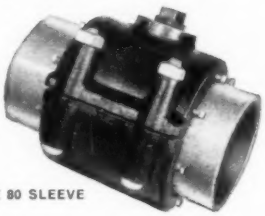
STYLE 90 STREET TEE

repair clamp, or



STYLE 60 CLAMP

repair sleeve



STYLE 80 SLEEVE

for every need

Only Dresser manufactures a complete line.

DRESSER MANUFACTURING DIVISION

Bradford, Pennsylvania

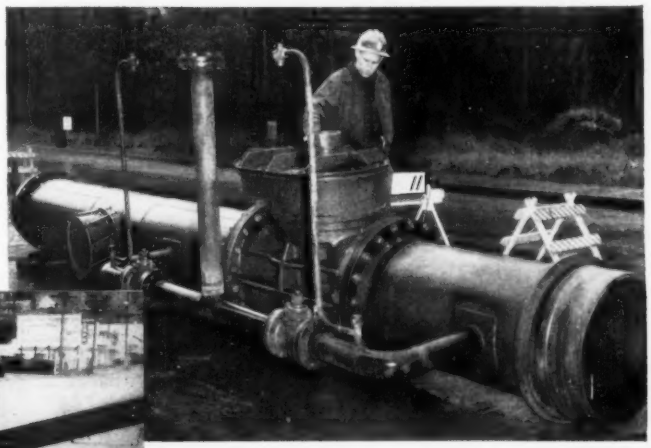
3-STEP VALVE INSTALLATION

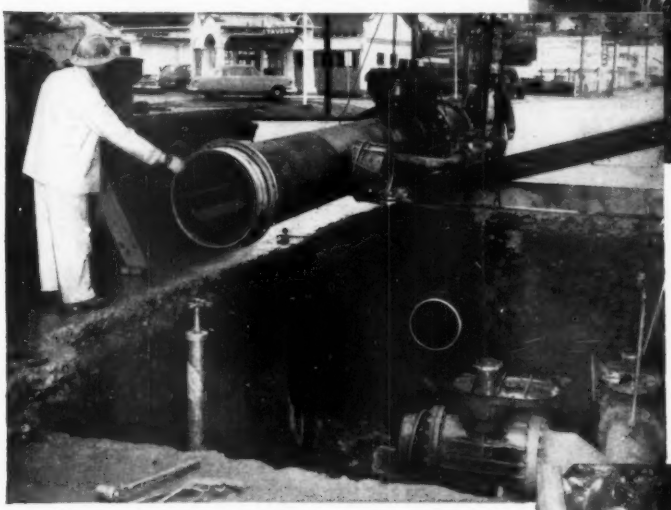
It's Fast and Easy with Dresser® Couplings

TIME is an important factor when a major feeder line shutdown is involved. Northwest Natural Gas Company of Portland, Oregon has developed a 3-step valve installation procedure that saves considerable time and vastly simplifies the whole operation. The sequence of illustrations shows how it is done.

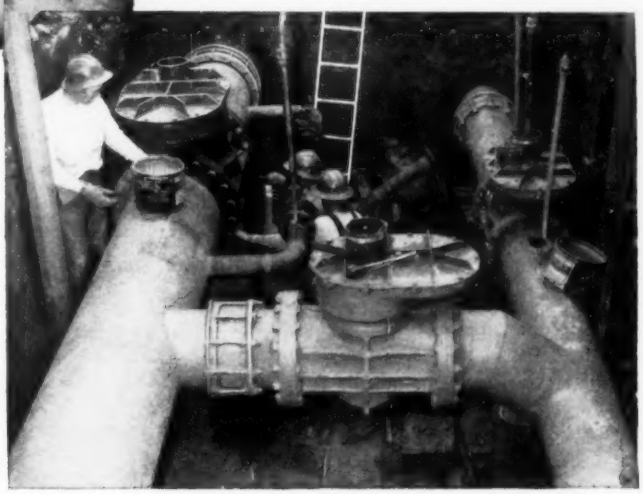
Dresser Couplings eliminate time-consuming, exact pipe fitting since they accommodate minor misalignments and still make positive, gas-tight joints. The time required for installation is essentially the two-man-minutes per bolt that it takes to make each Dresser Coupling a permanent, vibration-proof joint. And Dresser-Coupled joints will easily last the life of the line.

1. PREFABRICATION of the valve assembly speeds and simplifies installation, cuts shutdown time, and provides ample opportunity for joining and testing the joints of pipes with differing diameters or of differing materials *without the* excessive shutdown time required if this were done in the trench.





2. POSITIONING and lowering into the trench takes little time. The prefabricated valve assembly is complete with Dresser Couplings. Minor misalignments are readily accommodated; these flexible joints provide ample play for inexact pipe lengths or subsequent strains caused by ground settlement or vibration.



3. BOLTING UP the Dresser Couplings completes the installation. There has been a minimum of shutdown of the major lines; the installation has been fast, simple, economical . . . and most important, it is *permanent*.

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LOW AND NARROW!

Parsons® 77 Trenchliner®

It's not much wider than a yardstick...

. . . only 3 feet-10 inches wide, to be exact! What's more, this new 77 is just 5 feet-8 inches "low" with the boom in digging position. It only weighs about 6700 lbs., for convenient trailer-transport from job to job.

Trench depths to 5 feet

Small in size, but big in capacity, Parsons 77 has a work range that will surprise you. It produces from 4.4 inches to 21 lineal feet of trench per minute, in 32 hi-lo digging speed selections. You get trench widths from 6 to 18 inches — *and maximum digging depth of 5 feet!*

The tiny 77 is heavy-duty in every respect. It has positive down-crowd on telescopic ladder boom. Self-cleaning, cast steel buckets have self-sharpening removable point-type teeth. Shiftable conveyor is instantly reversible for controlled discharge. Compact and maneuverable, the 77 turns within its own length — each crawler is independently driven, independently braked. Better check what this small utility Trenchliner can do on your service lines, small mains, footings, etc. Ask Parsons distributor for demonstration, or write to us for literature.

A big, expensive rig isn't needed to transport this little 77 Trenchliner from job to job. Its low height and weight of only 6700 lbs. — permit fast one-man trailer loading — hauling under low overhead clearances. (Big ladder and wheel-types are also available.)

Mail to: PARSONS Company, Newton, Iowa *for literature on 77 Trenchliner*

NAME ..... TITLE .....

COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

P919 GAS

PARSONS Company • NEWTON, IOWA

A DIVISION OF KOEHRING COMPANY

ago. And the Canadian government is making noises as though it will react in about the same way as did our bureaucracy.

Initial studies leading to what may well be a Canadian version of this country's massive regulation of natural gas production, transportation and sales, are getting into high gear through the so-called Royal (Borden) Commission. In its interim report almost a year ago, the Borden Commission indicated it would eventually lean toward strict government controls.

Sales of natural gas in Canada in 1958 hit an all-time high of 206 trillion cu ft, up from 168 trillion in 1957. At the same time, sale of manufactured gas dropped from 15 trillion in 1957 to 5 trillion cu ft in 1958.

Number of customers receiving natural gas jumped from 645,000 in 1957 to 1 million in 1958, while the number of customers of manufactured gas dipped from 374,000 to 31,000 in the same period.

This is the kind of rapid growth that eventually led to government controls in this country and now such monumental problems for the industry.

For those with an interest in internal Canadian gas consumption, the 1958 figures show wide gains in all provinces except those in the Atlantic area. Gains were most pronounced in Ontario, Quebec, and Manitoba. Sales are listed as 115 billion cu ft in Alberta (114 billion in 1957); 53 billion in Quebec and Ontario (35 billion); 24.5 billion in Manitoba and Saskatchewan (12 billion); 9 billion in British Columbia (5 billion); and 85.7 billion in the Atlantic Provinces (145 billion).

Production of gas in Canada also showed a healthy gain, increasing from 220 billion cu ft in 1957 to 338 billion in 1958.

Increases were registered in all months of 1958. Production in December of 43 billion cu ft was a new monthly high and compares with 29 billion a year earlier.

By provinces, Alberta led, increasing to 239 billion cu ft from 183 in 1957; British Columbia to 63 billion from 8 billion; Saskatchewan to 20 billion from 13 billion; Ontario to 15 billion from 14 billion, and the northwest areas to 24 billion from 19 billion. ■

GAS ASSOCIATIONS

Edward A. Norman (right), newly elected president of GAMA, receives congratulations from outgoing president Clifford V. Coons during the recent GAMA convention.

PEP awards highlight sales conference

One of the highlights of the recent AGA sales conference on industrial and commercial gas was the presentation of the GAMA PEP winners.

A different method of making awards was launched this year to widen the scope of recognition for particular activities. The engraved plaques were presented to small, medium, and large gas companies. Winners were:

For achieving highest dollar sales per meter: Medium, United Gas Improvement Co., Harrisburg, Pa.; large, Laclede Gas Co., St. Louis.

For greatest improvement in PEP campaign participation: Medium, Bridgeport (Conn.) Gas Co.; large, Oklahoma Natural Gas Co., Tulsa.

For excellence in general promotional activities: Medium, Providence (R. I.) Gas Co.; large, Southern California and Southern Counties Gas companies, Los Angeles.

Grand award for best implementation and overall performance: Small, Roanoke (Va.) Gas Co.; me-

48′ BORE under highway for distribution line

with KA-MO 12″ dia. drill

To run a gas distribution line under main highway, a portable Ka-Mo horizontal drilling unit quickly bored a 12″ diameter hole, 48′ long, through hard compacted clay. Drill was powered by a 7½ h.p. air motor on standard double-track mounting. On similar type work, casing can be installed at the time hole is drilled, by using the casing attachment — giving maximum protection against costly cave-ins.

Ka-Mo offers tremendous versatility . . . light, portable drills . . . easy to operate for installing gas lines under streets, highways, railroads. Drills through sand, clay, gumbo, frost, shale, limerock, other mineral formations. Air, electric, hydraulic, diesel, gasoline engine powered.

100′ BORE and casing installation for gas main

This 20″ diameter Ka-Mo drill was used inside casing to bore a hole 100′ long through hard clay, under a railroad bed for new gas main. Drill was powered by a 15 h.p. air motor. Notice that drill and casing move forward at the same time.

Next time you have a drilling problem, check the Ka-Mo line. Drill sizes 2″ to 48″ dia. and larger, in sectionalized lengths are tailored to meet your own particular requirements. Information is available at no obligation. Fill out and mail coupon today.

Mail to: KWIK-MIX Co., Ka-Mo Tools Dept., 1845 South 55th Ave., Cicero 50, Ill.

☐ Send us free 12-page KA-MO bulletin ☐ Have distributor call

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... STATE .....

KAM906 GAS

KA MO KWIK-MIX COMPANY — Ka-Mo Tools Dept.

A DIVISION OF KOEHRING COMPANY

dium, The Gas Co. Division, Scranton-Spring Brook Water Service Co., Wilkes Barre, Pa.; large, Ohio Fuel Gas Co., Columbus.

NGAA elects Sun Oil's Webber to presidency

Charles E. Webber, technical advisor to the vice president of Sun Oil Co., Philadelphia, is the newly elected president of the Natural Gasoline Association of America. He was chosen at the group's 38th annual convention held in Dallas.

Vice presidents elected for 1959-60 are: Donald B. Edwards, Pan American Petroleum Corp.; John M. Kindle, Lone Star Gas Co.; Max R. Lents, Reef Corp.; and R. W. Heath, Signal Oil & Gas Co.

William F. Lowe, executive director of the NGAA, was presented the Hanlon Award, highest honor in the natural gasoline industry and one of the ranking awards in the petroleum industry. Mr. Lowe was secretary of the NGAA from 1934 until 1957, when he was named to his present post.

Metering group gathers

One of the highlights of the recent AGA distribution conference in Cincinnati was the 19th annual dinner given by Rockwell Manufacturing Co. to members of the gas metering subcommittee of the AGA.

Among guests were Andrew Lovretin Jr., superintendent of meters, gas department, Public Service Electric & Gas Co., Springfield, N. J., and Fred Peters, superintendent of gas measurement of New York State Electric & Gas Corp., Ithaca, N. Y. They are chairman and vice chairman, respectively, of the gas metering subcommittee.

Joe Harper of Rockwell was master of ceremonies. Highlight of the event was the presence of 10 former chairmen (including the present chairman), whose terms of office date back to 1942.

Stover heads Midwest group

Rolland S. Stover, of the R. S. Stover Co. of Marshalltown, Iowa, is the newly elected president of the Midwest Gas Association.

He was elected at the group's annual meeting held recently in Des Moines. About 325 members were in attendance.

Speakers at one of the general sessions of the recent AGA distribution conference in Cincinnati were (front row, from left): P. W. Kraemer, chairman, customer service committee and vice president, Minneapolis Gas Co.; T. J. Miller, Michigan Consolidated Gas Co. Back row: J. H. Betty, Laclede Gas Co.; G. G. Wilson, Institute of Gas Technology; and G. J. Sandusky, Southern California Gas Co.

GAS NEWS

Ohio Fuel expanding underground storage

Underground storage facilities will be expanded this year with a $2 million investment by Ohio Fuel Gas Co.

Ninety more storage wells will be drilled, according to OFG vice president in charge of production and storage, Herbert A. Titsch. Ohio Fuel already has 11 underground storage reservoirs in which nearly a third of all the gas needed during winter is kept ready to use.

Fifty-seven of the new wells will be drilled in the Medina county storage area. Started in 1958, this project will be completed late this year.

Also called for in the new program are 10 new wells in the McArthur storage area, 8 in Pavonia, 10 in Holmes, 10 in Weaver, and 5 in Wellington.

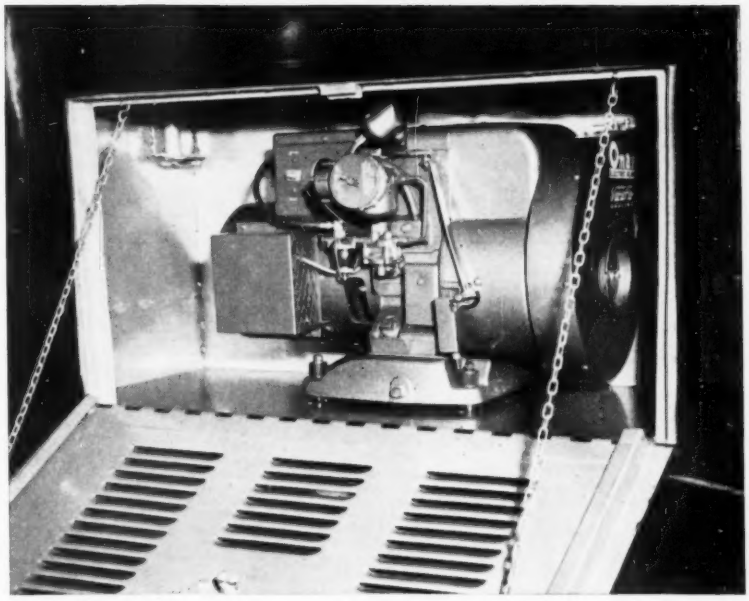
At the start of this year's current heating season, OFG had a record 187 billion cu ft of gas in underground storage. On a cold winter day about 50 per cent of the gas used comes from underground storage.

Milton J. Pfeiffer (right), vice president in charge of Cincinnati (Ohio) Gas & Electric Co.'s gas department, congratulates his company's 300,000 gas customer, Mr. and Mrs. Herbert F. Schleutker. They received an outdoor gas light, a gas dryer, and a specially inscribed meter as mementos of the occasion.

Onan ELECTRIC PLANTS

ELECTRIC PLANT NEWS

Onan ELECTRIC PLANTS



New dual-purpose Onan plants deliver A.C. power for tools; 30 amps for battery charging!

1,000 and 2,000-watt models available

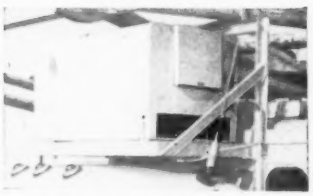
Mounted in maintenance and construction vehicles, these two new Onan Electric Plants cut costs two ways.

First, they provide plenty of plug-in A.C. power for floodlights and motor-driven tools.

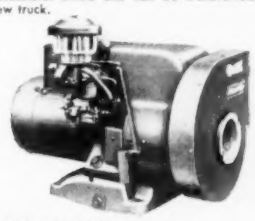
Second, they keep communication batteries charged without running the truck engine. The 30-ampere, 12-volt output handles the drain of 2-way radio and battery-powered lighting.

The difference in fuel cost between the single-cylinder Onan engines in the 2 to 4 H.P. range and truck engines of 150 H.P. or more has been reported as high as $800.00 per year or approximately twice the cost of the 1KW plant. To these fuel savings must be added savings in engine maintenance and reduction in labor costs.

These plants can be mounted within the truck body or above the cab in an Onan weatherproof steel housing. Leading body builders will install them to order. Plants are electrically started from the truck cab. Separate charging circuit keeps starting batteries charged. Call your Onan distributor for the whole story.



OVER-THE-CAB MOUNTING
Protected by Onan steel housing. Plant easily accessible. Entire unit can be transferred to new truck.



MODEL 1AJ-1RV1330
1,000 watts, 115 volts, 60-cycle with 30-amp. 12-volt battery charging output. One-cylinder, air-cooled Onan AJ engine.

See your Onan distributor or write for information

D. W. ONAN & SONS INC.

2861 University Ave. S.E., Minneapolis 14, Minnesota

ELECTRIC PLANTS • AIR-COOLED ENGINES • KAB KOOLER • GENERATORS

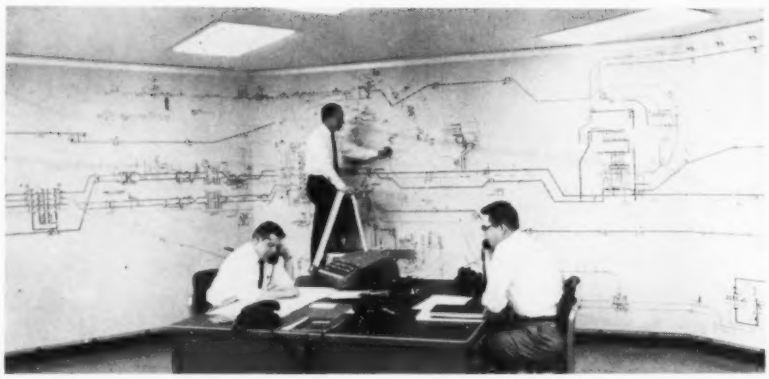
Onan ELECTRIC PLANTS

Range shipments up

Gas range shipments for the first quarter of 1959 raced nearly 16 per cent ahead of last year's, GAMA reports.

March shipments helped boost the total. The 148,700 free-standing ranges shipped in March represented a 12 per cent gain over the 132,800 shipped in March '58. For three months the new total, 414,400, as against 369,900 in 1958, also represented a 12 per cent gain.

Gas built-ins accounted for 24,700 units in March, up 48.8 per cent over 1958, and bringing the first quarter total to 63,400, up 50.2 per cent from 42,000.



Gas control center at East Ohio's new main offices in downtown Cleveland. Gas control personnel direct the flow of gas through close to 11,000 miles of East Ohio pipelines.

Aerial view of East Ohio Gas Co.'s new building in Cleveland. Officiating at the recent dedication ceremonies for the 21-story skyscraper were East Ohio president Robert W. Ramsdell, Cleveland Mayor Anthony J. Celebrezzee, and Robert Tishman, vice president of Tishman Realty & Construction, owner and builder.

New Utah company formed

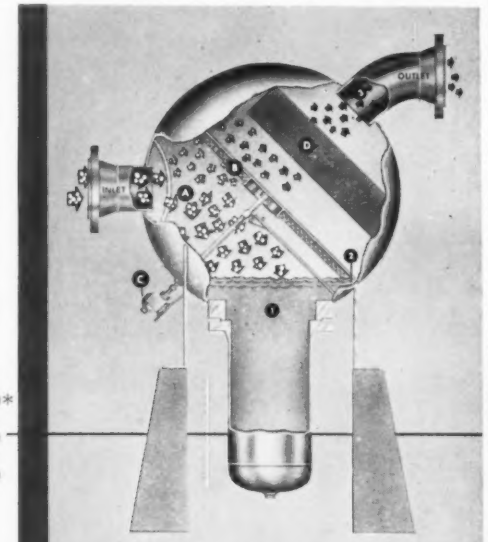
Citizens Consolidated Natural Gas Co. has been organized to serve communities in four central Utah counties: Juab, Sanpete, Sevier, and Millard.

Dr. P. L. Jones of Nephi is president of the new company. He said Citizens will seek a certificate of approval to sell and distribute gas in the communities. The company plans to buy its gas from El Paso Natural Gas Co.

MORE EFFICIENT RESULTS!

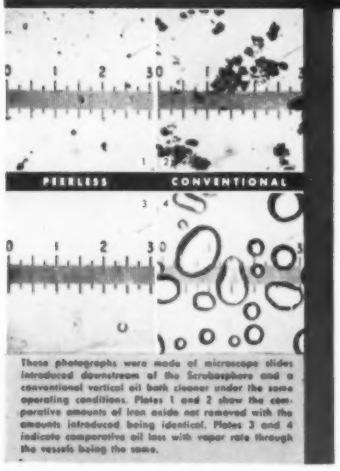
PEERLESS SCRUBOSPHERE*

*Spherical scrubber for dust and liquid removal from gas flow



LEGEND OF ABOVE CUTAWAY

The majority of incoming liquid (A) and solid particles are directed to either side and down into reservoir (1). Lighter solid particles carried by gas stream are separated on surfaces of contactor (B) which are kept wet and clean by revolving thru liquid reservoir (2). Contactor is revolved by explosion-proof gear motor (C). Mist Extractor (D) removes any remaining liquid particles from gas stream prior to outlet (3).



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self-cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 181

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PEERLESS MFG. CO. DALLAS TEXAS

"OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

Arkla building $2 million plant in Russellville, Ark.

Gas meters, industrial gas control devices and various household and commercial appliances will be produced at a new $2 million factory planned by Arkla Air Conditioning Corp.

Located in Russellville, Ark., the new plant initially will have 45,000 sq ft of floor space and will cost about $500,000. Tools and equipment will cost $1.5 million.

ALG board chairman and president W. R. Stephens said that a large volume of ALG's appliance research and development will be centered at Russellville. Arkla's two-year old research program has been conducted at Evansville, Ind. and Shreveport, La., and recently at Little Rock.

Edward Gilmore, who recently joined the company, will direct most of the research as well as actual production of meters.

The parent company, Arkansas Louisiana Gas Co., through its subsidiaries, now has industrial operations in being or on the boards at Emmett, Foreman, Pine Bluff, Magnolia, Little Rock, Malvern, and Russellville. The utility is building a $6 million pipeline from Clarksville to Malvern. And, one of its subsidiaries, Arkansas Industrial Pipeline Corp., has projected a $9 million pipeline from Malvern to Helena.

Missouri rate formula bill draws opposition

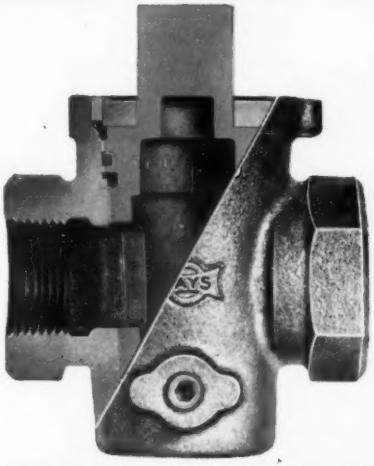
Missouri-based utilities are opposing a bill which would upset the state's formula for setting rates.

The proposal would require the regulatory commission to fix public utility rates on the basis of original cost less depreciation instead of property replacement costs. The bill's sponsor said it is a return to the former system of setting rates, a system upset by the state supreme court in 1957.

In that ruling the court said that the PSC could not rely exclusively on the original cost less depreciation formula to arrive at a fair rate of return.

An attorney for Gas Service Co. and Kansas City Power & Light said the commission in setting rates must not be tied to a self-executing formula. He said it must consider not only the value of property but numerous other factors to arrive at what makes up a fair rate of return on utility investments.

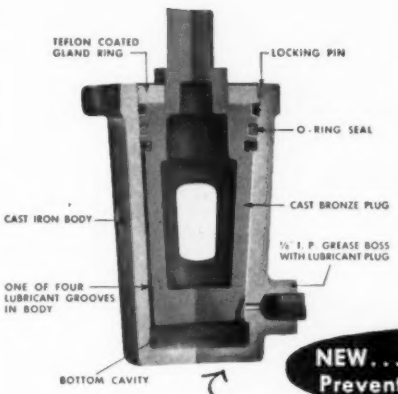
THIS GAS STOP WILL NOT STICK...



- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
- O-Ring prevents top leakage . . .
- Teflon Coated Gland Ring reduces friction between top of plug and gland ring...

Re-Lubrication does the TRICK

HAYS LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
- Individually tested . . .
- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

NEW... Solid Bottom Construction Prevents Leakage and Tampering

HAYS®

GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

ERIE, PA.

G-E combines functions in efficiency move

General Electric's communication products department, Lynchburg, Va., and the G-E technical department, Syracuse, are being combined in a single organizational structure. The new group, to be known as the G-E communication products department, is headed by Harrison Van Aken as general manager.

Two-way radio for the gas industries and microwave equipment for pipelines will be made at the department's Lynchburg plant. Closed circuit television products will be made in Syracuse.

Harold A. Strickland Jr., vice president and general manager of the company's industrial electronics division, said the combined department will be in charge of the broad communication and information handling field.

The communications products department is part of the industrial electronics division. This division is composed of several departments throughout the nation which are engaged in engineering and manufacturing equipment to help gas distribution and pipeline companies improve their operations.

Headquarters for the expanded operation are in Lynchburg. Plants will be maintained in both Syracuse and Lynchburg.

Standard Electric Time Co., manufacturer of the McIlroy fluid network analyzer among other products, is making a major addition to its plant in Springfield, Mass. Celebrating its 75th year, Standard Electric said the added space will allow modern in-line facilities to speed production and delivery.

New gas meter division set up by Neptune

Neptune Meter Co. has formed a new gas meter division headed by Walter H. Sieger. He's the former president of Revere Corp. of America, a Neptune subsidiary.

Superior Meter Co., of which Mr. Sieger also is president, is the core of Neptune's new division. Manufacturing facilities are in Brooklyn and Punxsutawney, Pa. Superior, a wholly owned Neptune subsidiary, is expected to benefit by the new setup from increased use of Neptune's national marketing facilities as manufacture and sale of Superior gas meters progresses from a local to a national scale.

THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

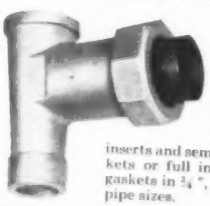
Insulating Couplings AND Fittings

Malleable Service Ell

The insulating principle depicted above is carried out in all Normac Ells and Tees.

NORTON McMURRAY has specialized for 20 years in the development and production of products solely for the Gas Industry. Whether your plans include modernization, or new, expanded facilities, Normac Gas Distribution Equipment will serve you well.

Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

Insulating Gaskets

The Normac insulating principle incorporates an efficient combination of a polyethylene sleeve and a semi-insulating gasket or full rubber gasket and retainer ring.

New CATALOG

Write for your copy . . . . it gives complete details and specifications of NORMAC equipment.

NORTON-McMURRAY Manufacturing Co.

919 North Michigan Avenue

CHICAGO 11, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees and Ells

More than 350 gas appliance dealers met in Wichita recently to help launch the Kansas phase of the Gold Star gas range program. Gas Service Co. sponsored the meeting. E. Carl Sorby, vice president of Geo. D. Roper Corp., described requirements for Gold Star designation and presented details of the $30 million campaign under way to bring attention to the advantages of Gold Star construction.

ALG and Reynolds Metals sign transport agreement

Arkansas Louisiana Gas Co. has agreed to transport gas from Reynolds Metals Co. own gas fields in Louisiana to the four aluminum plants operated by Reynolds in Arkansas. The remaining amount of gas needed will be supplied by ALG.

Reynolds recently acquired its own gas supply in northern Louisiana. It also owns its own discovery gas wells in northwest Arkansas.

W. R. Stephens, president and general manager of ALG, said the new 15-year contract frees 300 billion cu ft of reserves for other users. This is the equivalent of adding this amount to ALG's present system.

Fight on for underground storage in Maryland

Public hearings were held recently in Maryland on a proposal governing underground storage of natural gas.

Washington (D. C.) Gas Light Co. asked that requirements of the proposal to store gas at Brandywine in Prince Georges county be eased. Washington's Oscar Berry said that under the present bill "a handful of large landowners could block" the storage project.

The bill requires that 72 per cent of the landowners and 75 per cent of the acreage be committed to gas storage before the law could take effect. The law would give the company the power to condemn easement rights of land more than 1000 ft below the earth's surface.

Opposition to the storage bill was based on fears that the gas would be a hazard to the community, cause devaluation of property, possibly contaminate water supplies. Also that condemnation rights would give too much power to the company.

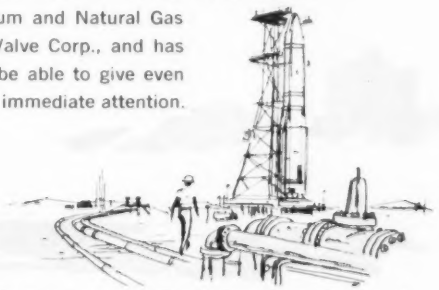
Washington Gas Light said the storage project eventually would save $2.5 million to $3 million a year in operating cost. This saving would result in a hoped for stabilization of gas rates throughout the Washington area.

The company has conducted a four-year campaign to achieve the 10,000 acre storage project. Witnesses told of the precautions and tests made to insure the area could contain the gas without endangering the community in any way.

Announcing...

Effective June 1, 1959 . . . **SECURITY VALVE CORP.**
will be located in South Pasadena, California

Increased use of Security Automatic Shut-off Valves in the Petroleum and Natural Gas Industries has resulted in a healthy business growth for Security Valve Corp., and has made possible our move to a new and larger plant. We shall now be able to give even better service. Send us your over-pressure protection requirements for immediate attention.



SECURITY VALVE

909 El Centro Avenue • South Pasadena, California
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McDONALD

THE QUALITY NAME IN GAS SERVICE STOPS

When you buy McDonald iron body gas service stops, shown below, you're assured of many years of long service. They are manufactured from the very finest materials. Over 100 years of engineering skill and experience in manufacture are further assurances of the very highest quality. Look for the name McDonald next time you buy.

iron body service stops

PLATE 10685

PLATE 10687

Where valves of this type are required or preferred, Plates 10685 and 10687 are guaranteed to give satisfactory service. All stops have iron bodies and bronze keys which are precision fitted and individually lapped. Each valve is individually tested and packaged in standard cartons to comply with A.G.A. specifications. Available in black or galvanized finish. Sizes — ½", ¾", 1", 1¼", 1½", 2".

For information on the complete line of McDonald gas service stops, write for free catalog.

A. Y. McDONALD MFG. CO.
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Chilton
PUBLICATIONS

Foremost IN THE FIELDS THEY SERVE

CALL A CHILTON MAN

CHILTON COMPANY
56th & Chestnut Streets
Philadelphia 39, Pa.
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IGT announces three summer sessions

Three courses in natural gas technology will again be offered this summer at the Institute of Gas Technology in Chicago.

The first of the three-week sessions, Natural Gas Transmission, runs from June 15-July 3. Subject matter: behavior of gas, methods of transmission, and control of distribution systems.

Natural Gas Distribution will be offered July 6-24. It will cover design, construction and maintenance of distribution systems.

The final offering is Natural Gas Fuel Utilization, from July 20-Aug. 7. This course will be broken down into three phases: fundamental theory of the combustion process, problems related to combustion systems, and applications relating to domestic and industrial use of gas.

Further information is available from the chairman, education program, Institute of Gas Technology, Technology Center, Chicago 16.

Management must pace 'exploding' technology

Business management must catch up with "exploding" technology if policymakers are to make sound decisions, Willard F. Rockwell Jr. told the 21st American Power Conferences recently.

The president of Rockwell Manufacturing Co. warned the power engineers, "management people in business and government need a far greater understanding of technology than they now have . . ."

He pointed out that management is now flooded with new data everyday on "throughputs," "neutron flux density," "value analysis" and similarly complex technical concepts that mean nothing to the laymen without technical orientation.

The concurrence of exploding technology and exploding population will place management in comparative technical dark ages if no formal program is launched for management to keep up with and get ahead of technology.

Rockwell said that technical courses in nontechnical schools are as important as humanities courses in engineering schools. He called on engineers and engineering educators to initiate courses in technology for undergraduates in nontechnical schools and for practicing management people. "Those in the best position to see the need must be the first to act," he warned.

Lancaster SYNTHETIC DIAPHRAGMS

UNSURPASSED

by any other material in any conditions of natural gas operations

MATERIAL DIFFERENCE
Basic material of the special Lancaster formula—Buna-N rubber—withstands roughest usage.
S-700-L SYNTHETIC DIAPHRAGMS for 1-A Sprague Gas Meters
NO FABRIC BREAKDOWN
Strength throughout! Cloth lining—the major point of failure—has been eliminated. No restrictions or leaks from fabric failure!

HIGH FLEXIBILITY . . .
LOW DIFFERENTIAL . . .
LANCASTER SYNTHETIC DIAPHRAGMS ARE REINFORCED AT ALL FLEXING AND HINGING POINTS . . .
WITHSTAND EXCESSIVE FLEXING

Use Lancaster S-700-L and S-7-L Synthetic Diaphragms with complete confidence in any natural gas operation. Not recommended for manufactured gas.

"a meter is only as accurate as its parts"

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Byers PVC Pipe scotches corrosion

where to use it:
underground mains/service lines

why Byers PVC Pipe?

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- no protective wrappings needed
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Note: high tensile strength of PVC Pipe allows higher working pressures than any other plastic pipe economically competitive in this service.

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Relief valve standard available from AGA Labs

More stringent demands are contained in the new American Standard listing requirements for relief valves and automatic gas shutoff devices for hot water supply systems.

The new requirements, effective since Jan. 1, were approved by the ASA in October. Sponsor was the American Gas Association.

The newest requirements strengthen markedly the 23-year-old standard replaced. Extensive changes in test procedure are involved. The effect, according to GAMA's relief valve division, will be to further advance service and protection to the public. A new section specifies that complete installation instructions be provided and gives the testing agency authority for review in this matter.

Copies of the standard are available at $1.50 each from the AGA Laboratories, 1032 E. 62nd St., Cleveland 3, Ohio.

Saskatchewan Power launches '59 building

Contracts were awarded recently by Saskatchewan Power Corp. for construction of main gas transmission lines and urban distribution systems.

Total cost of the company's 1959 construction program is an estimated $7.5 million.

One transmission line bid went to Marine Pipeline & Dredging Ltd. This Vancouver, B. C. firm will build 113 miles of 8-in. line from Regina to Yorkton and 72 miles of 6- and 4-in. lines from St. Louis (on the Saskatoon-Prince Albert line) east to Tisdale. Cost: $3.5 million.

The other major transmission project covers 80 miles of 10¾-in. line from Success to Rosetown. It will connect the present north and south gas systems into one province-wide grid. Dutton - Williams Brothers Ltd. will do the job, estimated to cost $2.4 million.

Among new urban distribution systems slated for this year is the system for the city of Yorkton, the only Saskatchewan city still unserved. Contractor is H. B. Contracting Ltd.

The largest single distribution project for this year consists about 5.5 miles of pipe ranging in size from 1¼ to 8 in., plus 1500 service connections. There will also be a short lateral connecting the city to the new transmission line running

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INCORPORATED (ESTABLISHED 1836)
General Offices: Philadelphia 16, Pa.
Sales offices in principal cities.

from Regina to Yorkton. Overall cost: $715,000.

Building distribution systems for seven northern centers is Robb Construction Co. Ltd. Some $730,000 will be spent in Tisdale, Star City, Melfort, Kinistino, Hoey, Dana and Cando.

The remaining contract went to Banister Construction Ltd. for construction of distribution systems in Moosomin and Bienfait. Cost: $200,000.

Branch stress connection report issued

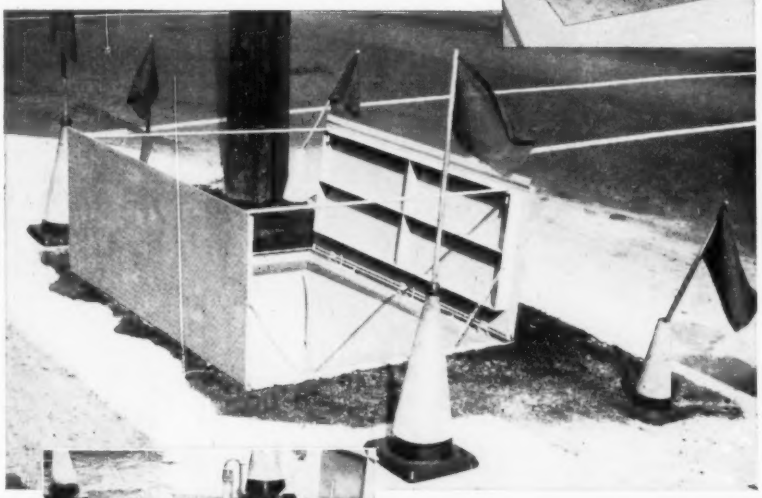
Means of eliminating high stresses in gas pipeline branch connections are outlined in an engineering report published by the AGA pipeline research committee.

Prepared by Battelle Memorial Institute for the AGA, the report summarizes all available data to determine the present level of knowledge concerning gas transmission and distribution branch connections. Experimental stress analyses of more than 70 connections are reviewed. Where information is available, recommendations are presented for design details aimed at keeping stresses low.

Copies of "Branch Connections Report 2: Survey of Reseach" are available from the AGA, 420 Lexington Ave., New York 17, for $2.

Ground is broken for $4 million Robertshaw-Fulton plant at New Stanton, Pa. It will replace present Robertshaw Thermostat division plants at Youngwood and Scottdale, Pa. From left: Frank H. Post, vice president, Robertshaw-Fulton and general manager, thermostat division; T. T. Arden, Robertshaw-Fulton president; and Christy Payne Jr., vice president of Peoples Natural Gas Co., Pittsburgh.

easiest access to regulators under-the-sidewalk



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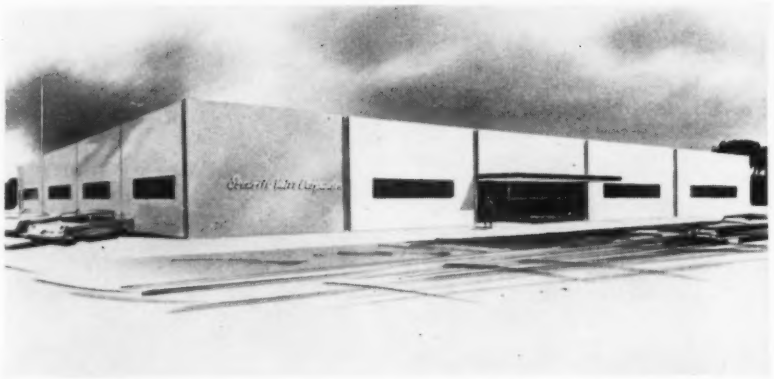
GAS • News Notes

Dravo Corp., Pittsburgh, is launching a nationwide leasing plan for its line of industrial and commercial space heaters and other equipment. The plan is operated in conjunction with the United States Leasing Corp., San Francisco. It makes it possible for companies to acquire needed equipment for base lease periods ranging from three to seven years.



Artist's sketch shows future home of Security Valve Corp. in South Pasadena, Calif. The 11,000-sq ft precast tiltup concrete structure will house administrative, engineering and manufacturing facilities.

A "Survey of Gas Distribution" will be published in the Aug. 26 issue of the *Gas Journal* of London, England. Detailed information on the survey is available from G. W. Battison, Editor, 11, Bolt Court, Fleet Street, London, E. C. 4.

Natural gas service is reaching Sparta, Ohio, with completion of a new Ohio Fuel Gas Co. pipeline. In addition to the $12,800 line, a new regulator building has been installed.

The U. S. District Court in Los Angeles has permanently enjoined Arthur Crigler and his company, California Water Heater Service, from using the AGA's seal of approval on rebuilt appliances. The defendant is a rebuilder of gas water heaters who allowed the seal, affixed to the appliance by the original manufacturer, to remain on the heaters after they had been rebuilt.

Stockholders of Commonwealth Natural Gas Corp. approved a plan to double the number of shares outstanding and split the Richmond, Va. company's stock on a two-for-one basis.

The newly formed Griffin Pipe Division, Griffin Wheel Co., Chicago, has awarded contract for engineering and construction of the cast iron pressure pipe foundry to be built at Council Bluffs, Iowa. The plant will produce cast iron pressure pipe in 4- through 12-in. sizes in 20-ft lengths.

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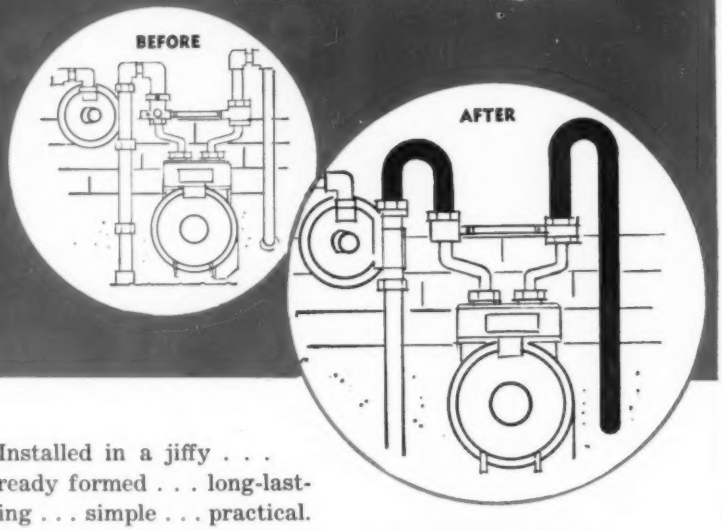

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LEBANON, OHIO

Ugite Gas Inc., United Gas Improvement subsidiary, is buying assets of Eastern Propane Co., Malvern, Pa. Eastern Propane handles LPG in southeastern Pennsylvania, in York, Lock Haven and Lykens, Pa., and in Thurmont, Md. Arthur E. Bone, president of Eastern Propane, becomes president and general manager of Ugite.

Northwestern Utilities Ltd. has moved its offices to 10040-104th St., Edmonton, Alberta, Canada.

The Heating Ventilating Air Conditioning Guide for 1959 has been enlarged to an 8½x11-in. page size to provide additional space for new technical data. Publisher is the American Society of Heating Refrigerating and Air Conditioning Engineers, 62 Worth St., New York 13. Larger illustrations, working charts and tables are included.

Aetna Engineering Co., Alton, N. H., is distributing 4-D wrought iron pipe for A. M. Byers Co., Pittsburgh.

Ohio Brass Co. and its subsidiary, Holan Corp., have purchased Universal Hydraulics Inc., Cleveland maker of hydraulic components. Universal will operate as a subsidiary of Holan.

Peterborough, Ontario, has joined the more than 100 Ontario communities to receive natural gas service from Consumers' Gas Co. since 1955. Citizens of the 42,288-population city sold their city-owned gas distribution system to Consumers' last November.

Wescott & Greis Inc., American Meter Co. subsidiary, has become the southwest division of American Meter Co. Harold W. Wahl is manager of the division, headquartered in Dallas. James H. Satterwite, president of Wescott & Greis, is retiring after 40 years in the gas industry. Cade C. Clover has been named northern district manager in Tulsa. Earl B. Cutter Jr. is southern district manager in Dallas.

Consumers Power Co., Jackson, Mich., has been awarded a certificate of excellent management for 1958 by the American Institute of Management.

American Steel Foundries, Chicago, has purchased the assets and business of South Bend (Ind.) Lathe Works.

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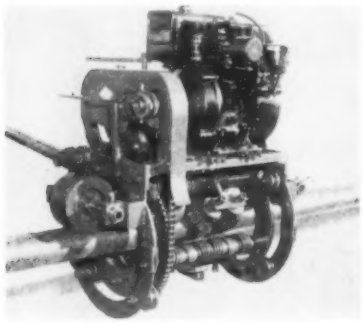
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 105, 106

1. Coating pipe couplings

Quick, economical and uniform field coating of pipe couplings is possible with Dresser's new Kupl-Koter. It consists of two halves, each having a sponge rubber gasket firmly cemented in a groove in the leading edge. All coatings are handled at recommended pouring temperatures. Protection is complete, with a minimum thickness of ⅛ in. of coating applied over the coupling. Neither tamping or special backfilling is required.
Dresser Manufacturing Division

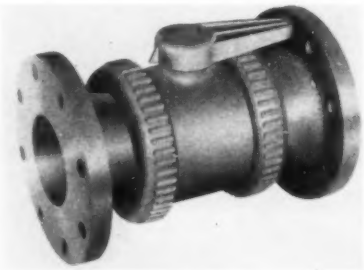


2. Pipe cleaning

Remco's new self-propelled pipe cleaning machine is for new pipe as well as for maintenance and repair work on existing pipe. Capable of cleaning up to 25 ft of pipe per minute, the machine requires but 6 in. of clearance under the pipe. Ideal for working on loaded pipelines, the machine is lightweight and nearly vibrationless. The self-propelled machine can be operated by one man.
Remco Manufacturing Co.

3. Portable X-ray

A 50-lb industrial X-ray generator from Picker X-Ray Corp. is small enough to pass through a 6-in. opening but powerful enough to radiograph 1¼ in. of steel in 45 seconds. The Andrex 140 KV unit is designed for quick on-the-job inspections by one man. It can be used to radiograph pipelines for the detection of inner flaws in the metal.
Picker X-Ray Corp.



4. Plastic ball valve

Chemtrol's all plastic molded 4-in. ball valve has been developed for corrosion service. The venturi-throated valve has straight-through, nonturbulent, low pressure drop flow characteristics. It is fitted with 150-lb flanges. Featuring one-quarter turn shutoff, the valve has provision for seat seal take-up. It is available in PVC types I and II, Kralastic, polypropylene, and Penton.
Chemtrol

5. Air purifier

An ultraviolet air purifying attachment is available for Arkla Sun Valley gas air conditioners. The attachment reduces both bacteria and odors present in the circulating air stream. Optional equipment on the 1959 Sun Valley All-Year gas units, the device also is available in kits for ready installation on existing systems.
Arkla Air Conditioning Corp.

6. Gas light burner

Maxitrol has designed a new gas light burner that produces ideal gas-air mixture for better gas light burner operation. The burner has a new aluminum venturi, contour-machined to close tolerances. The P-103 burner is said to produce uniform mantle lighting without dull or dark spots.
Maxitrol Co.

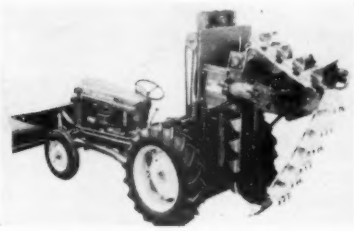
7. Pipe putty

Minnesota Mining's new pipe putty takes the sharp corners out of pipe fittings prior to application of pipe protection tape. Called Scotchrap brand pipe insulation putty, the new compound was developed to make taping of irregular shapes such as tees and

couplings better and easier. It provides a smooth taping surface, practically eliminating any wrinkles or buckles in the tape.
Minnesota Mining & Mfg. Co.

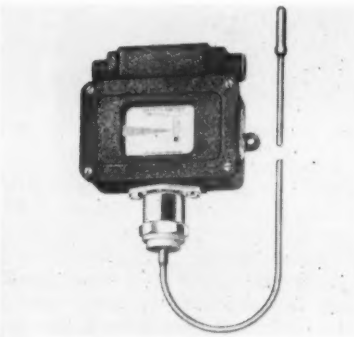
8. Gas light

Trageser's new gas light uses a mechanism that permits the light to be turned on and off from inside the house. In addition, the light intensity of the Vari-Ray gas lamp can be dial controlled to give variable brightness.
Trageser Copper Works



9. Trenchers

Earth Equipment's new 2000 series of Everett trencher is designed for easy attachment to many models and makes of tractors. Trenching up to 24 in. in width is possible with the new 2000.
Earth Equipment Corp.



10. Safety switch

In the event of pilot flame failure, Partlow Corp.'s new SBS safety switch automatically shuts down both pilot and main fuel flow by actuating a solenoid valve. All fuel is shut off in 30 to 45 seconds. Simple and positive in action, the SBS safety switch can be mounted in any convenient location and in any position as long as the instrument body is not subjected to abnormally high temperatures.
Partlow Corp.

11. Automatic well tester

General Controls' Industrial Systems division has developed an automatic well tester. This is the first in a series of automatic controls for oil field production uses. Designed specifically for use in the field, the well tester needs only 200 watts of standard 60-cycle, 110-v ac. It can be operated on emergency batteries in case of power failure.
General Controls Co.

12. Warning flags

Made of vinyl bonded to nylon material, a new type warning flag is uniformly bright on both sides, giving extra visibility, day or night. Thermally reinforced edges provide very high tear strength. Industrial Products Co. reports that the flags will not fade or discolor and are highly resistant to abrasion and temperature extremes.
Industrial Products Co.

13. Leverage wrench

One man can do the work of two—and two can do the work of four—with the Ridgid compound leverage wrench. Pressure applied on the extra sturdy malleable handle is multiplied by two as the adjustable hook jaw turns the pipe in one direction while the offset chain vise head grips the fitting and exerts an equal pressure in the opposite direction.
Ridge Tool Co.

14. Talking gas light

A remote loudspeaker attachment for special use with Arkla Gaslites is announced. The attachment consists of two speakers mounted on a post just under the lamp case. It can be easily wired into any radio, phonograph, hi-fi or loudspeaker system.
Arkla Air Conditioning Corp.

15. Steel tape thermometer

Keuffel & Esser has introduced a new thermometer used to calculate expansion and contraction of steel measuring tapes in extreme temperature conditions. It has a mercury reservoir bulb that is held in direct contact with the tape, thereby measuring actual tape temperature rather than air temperature.
Keuffel & Esser

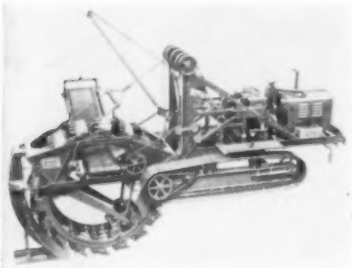
16. Stainless fittings

Tube Turns' new line of light-wall stainless steel fittings and flanges are for nominal-temperature, low pressure, non-critical processing piping. The new Pipe-Mate line features long tangents that permit easy alignment of fittings and pipe and allow clearance for fabrication of completely flanged elbows, returns, tees, and

crosses. The line also features a novel swivel-type insert flange especially designed for ease of alignment.
Tube Turns Division

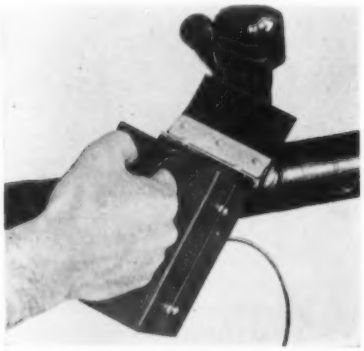
17. Synthetic diaphragms

Sprague Meter has available synthetic diaphragms in two meter models—Types 175 and 240. Features claimed for these meters on the basis of exhaustive lab and field tests include improved initial stability of proofs and sustained accuracy over an extended period of years. Vulcan Rubber's synthetic diaphragms are adaptable to all existing Sprague meters.
Sprague Meter Co.



18. Pipeline ditcher

Gar Wood's new medium duty pipeline ditcher features a torque drive and complete hydraulic action. The Gar Wood-Buckeye 318 digs up to 7 ft in depth, with cut widths up to 44 in. The torque-o-matic drive works in conjunction with a tailshift governor. With this arrangement, the digging wheel maintains a constant speed regardless of changing conditions, since the governor regulates engine torque as required.
Gar Wood Industries Inc.

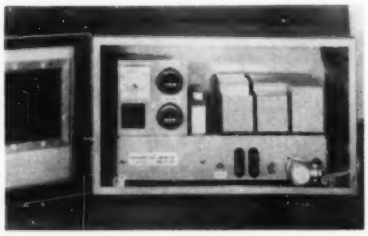


19. Holiday detector

Increased efficiency in holiday seeking is claimed by Tinker & Rasor's new conductive silicone rubber electrode. High voltage electrical energy is used in the new detector. The flexible electrode easily adapts itself to shape to surface irregularities and can be used with all types of holiday detectors using high voltage electrical energy. It comes in various widths—2, 4, 8, 12 and 16 in.
Tinker & Rasor Co.

20. Voltmeter

Motorola's entry into the field of electronic instrumentation is marked by the introduction of an all transistorized, battery operated ac voltmeter. Lab performance and range are combined with easy portability in the unit. It can be used to design, test, install, adjust and service electrical and electronic equipment of many types.
Motorola Inc.



21. Flow measuring system

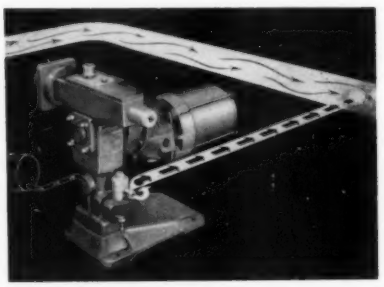
Gas or liquid flow is monitored or controlled by a new electronic flow measuring system. The system is composed of transducers to measure pressure and temperature, a computer, integrator, and counter. Signals from the system can be telemetered or used to control flow. Accumulated volume is registered on a mechanical counter or on a strip chart.
Computers Inc.

22. Truck line

Advances in styling, power and pickup body design are combined with a high degree of truck-to-job model specialization in a new line of International trucks. The new line is in the 4200- to 33,000-lb gross vehicle weight range. Shown here is the Model B-110 truck featuring an extra wide Bonus-Load pickup body and custom cab. It is rated at 4200 to 5800 lb gross vehicle weight.
International Harvester

23. Aluminumcase meter

The new AL-175 Aluminumcase meter is designed for dependable domestic service. American Meter's lightweight AGA Class 175 meter reduces costs for shipping, handling and setting. The one-piece, die-cast aluminum alloy body also provides exceptional resistance to impact damage according to the company. It is rated at 175 cfh of 0.60 sp gr gas at ½-in. wc differential.
American Meter Co.



24. Metering pump

Latest addition to the McCannameter line of metering pumps automatically proportions chemicals to any mainline flow. The packless pneumatic stroke-controlled meter uses its pneumatic stroke-controlled instrumentation to maintain a constant discharge in proportion to the mainline flow. Working on a 3 to 15 psig air signal, the instrument requires no additional power source of air, responds instantaneously to eliminate backflash and

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keep chemical discharge-to-flow ratio precisely accurate.
Hills-McCanna Co.

25. Wheel ditcher

Barber-Greene's Model 774 wheel ditcher can now be equipped with a wheel to dig to a maximum of 30 in. wide and 7 ft deep. This deeper digging depth brings wheel ditcher economies to utilities and pipeline construction. Model 774 offers digging abilities comparable with much larger machines, plus a high degree of maneuverability and many other features.
Barber-Greene Co.

TRADE LITERATURE

26. Meter loops

Meter loops and risers from Production Plating Works are covered in a new bulletin. The loops and risers are ready formed and ready for installation. They come with 90 and 180 deg. bends of ¾-, 1- and 1¼-in. pipe. The loops are threaded on one or both ends.
Production Plating Works Inc.

27. Welding fittings

The company's expanded line of seamless carbon steel welding fittings is covered in Form 593 from Dresser Manufacturing. The 20-page, two-color catalog contains complete tables of specifications, product photos, engineering drawings, ASA tables, manufacturing details, and other useful information.
Dresser Manufacturing Div.

28. Check valves

Daniel piston controlled check valves are covered in a revised catalog section (H). The new edition describes the positive control features of Daniel check valves, and includes specifications and parts lists.
Daniel Orifice Fitting Co.

29. Purifiers and scrubbers

Purifiers, scrubbers, mist extractors and separators for the gas industry are covered in a new folder (601) from V. D. Anderson Co. Four principal liquid and dust type scrubbers are cataloged. Detail drawings, complete size data, description, applications and photos are shown so that specifications can be readily compiled.
V. D. Anderson Co.

30. Serviceman's handbook

A 48-page quick-reference pocket size handbook provides basic technical information for the gas serviceman. Rockwell has prepared the "Gas Products Handbook of Technical Data" specifically for gas meter and regulator servicemen. In addition to vital reference tables and data on meter and regulator specifications and dimensions, Bulletin 1106 covers such subjects as inflammability limits of gas, flow of gas in pipes, low pressure flow in pipes, etc.
Rockwell Manufacturing Co.

31. Microwave

A series of microwave bulletins from General Electric features channel facilities in G-E 2 KMC systems. Compiled under No. ECM-72, the bulletins describe terminal stations, multiplex repeaters and junctions which serve as "doors" through which information comes into and departs from the microwave carrier.
General Electric Co.

32. Piloted pressure regulator

OPW-Jordan has redesigned its ½-in. to 2-in. size piloted pressure regulator to improve its performance by providing minimum maintenance, tight shutoff, and more accurate regulation. Features, sizing information, dimensions, etc., are contained in a four-page bulletin, J-1160.
OPW-Jordan

33. Film documentation

Operations of Cinefonics Inc., Cook Electric division, are covered in a new booklet. The division produces motion pictures for industry and government.
Cook Electric Co.

34. Technical data catalog

Lefax pocket-size technical data books are described in the company's revised 1959 catalog. The books cover every field of engineering and are of constant use to engineers, technical men, etc.
Lefax Publishers

35. Battery chargers

A complete line of silicon battery chargers offering a wide variety of new features is described in new literature from Acme Electric Corp. The single phase Magnistrol chargers are designed for float charging battery installation ranging from 10 cells to 63 in five basic amperage capacities in three voltage ranges.
Acme Electric Corp.

36. Pressure ratio computer

Descriptive information is available on a pneumatic pressure-ratio computer that measures compressor inlet and outlet pressures while simultaneously calculating the ratio of the two. Outstanding features of Hagan Chemicals' computer are wide range, flexibility, accuracy and pneumatic signal transmission.
Hagan Chemicals & Controls

37. Rotary compressor

Ingersoll-Rand has added a new 250-cfm size to its line of Gyro-Flo compressors. The new size, described in literature from the company, replaces the company's Gyro-Flo 210. Model 250, with a completely new compressor system, is driven by a larger, more powerful engine, yet retains the same 1800-rpm engine speed.
Ingersoll-Rand Co.

38. Power plants

Design, construction and mechanical advantages of the two recently introduced Allis-Chalmers power plants—the 21000 and the 16000 diesel engines—are described in a 16-page catalog. Illustrations, including charts, graphs, and a cutaway view of the engines, visually describe the new units.
Allis-Chalmers Mfg. Co.

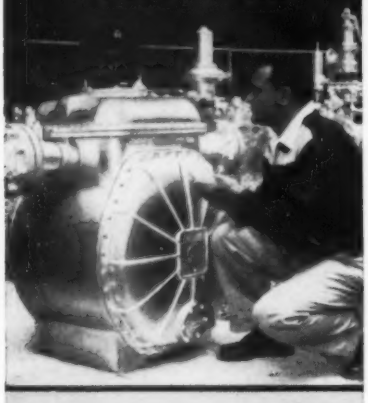
39. Moisture monitor

Uses, features, operating characteristics, specifications and other details of portable moisture monitors made by Consolidated Electrodynamics are described in an eight-page, illustrated brochure (No. 1834C).
Con. Electrodynamics

40. Venting film

A new sound stripfilm on gas appliance venting has been released by the AmeriVent division of American Metal Products. "The Story of Double-Wall Gas Vents" covers the evolution of venting.
AmeriVent Division

FOR ACCURATE
FLOW MEASUREMENT
365
DAYS A YEAR



USE AMERICAN® BASE VOLUME AND BASE PRESSURE INDEXES

American BASE VOLUME INDEXES register gas quantity at standard conditions of base temperature and base pressure. BASE PRESSURE INDEXES automatically multiply volume at line conditions by the pressure factor and indicate quantity at base pressure on a straight reading index.

No computations...accurate gas volumes at base conditions are shown immediately. A second counter on the back indicates volume at line conditions. Simple operating principle... integration is continuous with all functions performed mechanically through special gearing.

Write for Bulletins 200 and 201.

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INCORPORATED (ESTABLISHED 1836)
General Offices: Philadelphia 16, Pa.
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GAS · PEOPLE

R. T. McElvenny
MichCon

J. H. Long
Philadelphia

Michigan Consolidated Gas Co., Detroit, has eliminated the office of chairman of the board and consolidated the duties of that office with the office of the president. RALPH T. MCELVENNY, chairman and chief executive officer since 1954, was elected president. New member of the board is WILBER H. MACK. He is also executive vice president and a director of the Michigan Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co., affiliates in the American Natural Gas System. Both vacancies were created by the recent death of HENRY TUTTLE.

J. LUTHER DAVIS has been elected president of Tucson (Ariz.) Gas, Electric Light & Power. He succeeds J. R. SNYDER, who served as president for 13 years. Davis, 34 years of age, is one of the youngest utility presidents in the country. He joined Tucson Gas in 1955.

J. HENRY LONG has been elected vice president in charge of gas operations of Philadelphia (Pa.) Electric Co. Long joined the company's gas department in Chester in 1927. He became, successively, superintendent of coke ovens, plant superintendent, superintendent of gas plants, superintendent of gas production, general superintendent of gas production, general superintendent of gas operations, and manager of gas operations.

D. M. M. GOLDIE has been named general solicitor, heading B.C. Electric's legal division in Vancouver, B. C. Goldie succeeds A. BRUCE ROBERTSON, who was named vice president and general counsel.

Recent appointments at Bryant Manufacturing Co., Indianapolis, include naming HOWARD J. BERKEL as director of public relations; KEITH T. DAVIS manager of gas air

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY
Incorporated
3164 S. CALIFORNIA AVE.
CHICAGO 8, ILLINOIS
Elizabeth, New Jersey

conditioning; EARL T. RICHARDS JR. assistant manager for the company's new gas air conditioning equipment; and WALTER R. LEANDER as product manager for gas furnaces.

Newly elected officers of the Winnebago Natural Gas Corp., Kaukauna, Wis., are: J. F. COTA, president and general manager; E. H. SCHMIDT, vice president; B. F. CRAWFORD, secretary and treasurer; R. H. LAWRENZ, assistant treasurer; and W. T. RIESER, assistant secretary. Newly elected directors, in addition to Schmidt and Crawford, are J. C. COLMAN, MILTON FALCOFF, and GEORGE NEWLIN. Schmidt is president of Natural Gas Distributors Inc., while Cota is vice president and general manager.

JOHN M. SHANLEY JR. is New England sales representative of the Vulcan Rubber Products Division of Reeves Brothers Inc., New York.

FRED MAYTAG II, president of the Maytag Co., is a new director of Minneapolis - Honeywell Regulator Co.

JOHN ALICO has been appointed manager of manufacturing of the Walworth Co., New York. He will be responsible for activities of the company's four plants.

LARRY B. GUISINGER, business promotion representative for Ohio Fuel Gas Co., has been named Steubenville business promotion representative for the Ohio Valley Gas Co. Both Ohio Valley and Ohio Fuel are Columbia Gas subsidiaries.

CHARLES KIEL JR. is the newly elected vice president, operating services, of Long Island Lighting Co. He joined LILCO's construction department in 1933.

RICHARD S. REYNOLDS JR., president of Reynolds Metals Co., has

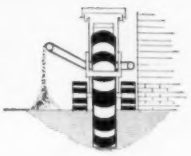
L. B. Guisinger
Ohio Valley

Charles Kiel Jr.
LILCO

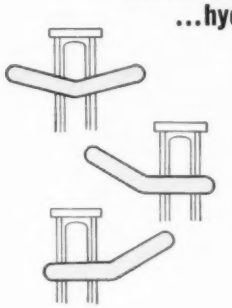
THE MACHINE / for distribution digging

...the new Cleveland J-20 trencher

- less than 5' wide over its crawlers
- digs 13" to 24" wide, down to 5' 6" deep
- puts 24" trench within 20 inches of a parallel wall
- maneuverable full crawler mounting... perfect balance and stability, easy on lawns and sidewalks
- fast, accurate, clean, dependable... nothing digs trench like a Cleveland

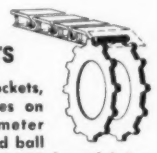


Cleveland's unique new V conveyor
...hydraulically shifted... independently driven



- digs past poles, trees, shrubs... places spoil where needed — without interrupting other operations
- lever at operator's seat controls hydraulic shifting and positioning of conveyor
- dual independent hydraulic drive gives operator fingertip control of conveyor belt direction and speed — independent of all other operations
- self-contained hydraulic motor and planetary gear drives in each head pulley eliminate all conveyor chains and sprockets
- provides constant elevating angle for faster, higher spoil discharge
- Maximum clearance under digging wheel rims permits higher heaped loads without clogging
- conveyor design reduces rolling and tumbling

world's finest trencher crawlers



... double flanged sprockets, rollers, wheels... drives on each end of 1½" diameter hardened pins... sealed ball and roller bearings... 1,000 hour lubrication... a tremendously long-lived, easy-rolling track.

hydraulic crumbing shoe

... optional, extra... pivots upward... fingertip control makes crumbing shoe advantages practical in crowded digging conditions.

engine • crawlers • hoist • wheel crumbing shoe • conveyor speed-direction-shift / *Every operation controlled at operator's seat*

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BROKEN PIPES REPAIRED *in minutes!*

For permanent repair, simply install beside break, slide over, and tighten... Stainless Steel bands, Neoprene Gaskets. Write for literature.

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- NO WIRES, BATTERIES or SWITCHES—simple, powerful magnetic action, factory adjusted to YOUR geographical location assures unfailing results!
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- GUARANTEED—to function regardless of weather, surface or ground cover!
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for leakproof, pressure-tight connections
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SEALING COMPOUNDS

Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

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LIQUID WRENCH®
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LOOSENS rusted bolts, nuts, screws, 'frozen' parts

Liquid Wrench works *fast*...yet is absolutely safe for all metals and alloys.

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At Industrial, Automotive, Hardware, Plumbing Jobbers

RADIATOR SPECIALTY CO.
Charlotte, North Carolina
SOLDER SEAL

been elected chairman of the board of directors of Robertshaw-Fulton Controls Co., Richmond, Va. He replaces JOHN A. ROBERTSHAW, who will serve as vice chairman of the board until his retirement on June 30. JOHN H. KREY was elected a member of the firm's executive committee.

R. H. DANFORD has been appointed district representative for the western areas of the U. S. by Parsons Co., Newton, Iowa. His territory includes Washington, Oregon, California, Arizona, Nevada, Montana, Idaho, Utah, Wyoming, Colorado, New Mexico and the Texas Panhandle.

W. L. NOPPER has been named district manager of the New York sales office of Roots-Connersville Blower Division, Dresser Industries, Inc. He will supervise sales of Roots-Connersville equipment in the New York metropolitan area including northeastern Pennsylvania, northern New Jersey, eastern New York state, and Connecticut. Succeeding Nopper as district manager of the Philadelphia sales office is R. G. NANCARROW. For the past five years, Nancarrow has been a field engineer in the company's Chicago office. His new territory includes eastern Maryland, southern New Jersey, and Delaware.

HILTON W. GOODWYN JR. has been named treasurer and assistant secretary of the Commonwealth Natural Gas Corp., Richmond, Va. He takes over the duties of treasurer from CHARLES C. DRUMMOND. Drummond, for many years both secretary and treasurer, has been named secretary and comptroller. GRAYSON E. TUCK was promoted to assistant treasurer.

A number of promotions have been announced by Ohio Fuel Gas Co., Columbus. GERALD E. LAVER, business promotion representative in Lorain, becomes an air conditioning specialist in Columbus. G.

W. M. Connor
Rockwell

S. W. Brown
Rockwell

ORION DICKSON, Coshocton business promotion representative, is now a gas advisor in Columbus. GEORGE C. MORGAN, district business promotion manager for OFG, has been promoted to a similar post in Toledo. HAROLD G. GIBB, general cashier, is now assistant manager of purchasing and stores. A. W. MEYERS, Bay Village manager for OFG, has been named Newark division manager. He succeeds the late G. CARL NEES. New home service director in the Steubenville district is CAROLYN J. KRAUSE. She formerly was in the Fremont district.

TRAVIS W. BRASFIELD has been appointed Kralastic commodity sales manager for the Naugatuck Chemical division of United States Rubber Co., New York. He succeeds ARTHUR K. O'KEEFE, who was recently elected president of the Texas-U. S. Chemical Co.

WILLIAM M. CONNER, assistant to the vice president of Rockwell Manufacturing Co.'s meter and valve division, has been promoted to general manager of the Statesboro, Ga. plant. SAMUEL W. BROWN, Statesboro general manager, has transferred to the Uniontown, Pa. plant as assistant general manager. Rockwell's meter and valve division has two new branch managers. MICHAEL P. GROOM heads the new El Paso sales office and JOHN R. APPLEGATE is in charge of the Detroit sales office. The El Paso office is being transferred from Midland, Texas, and from the company's southwest region to the midwestern region.

JOHN C. WALLACE has been elected president of Walworth Co., New York. His appointment culminates the two-year period he has been with Walworth, in which time he has held three vice presidential positions. The most recent of these was vice president and general manager. Other appointments at Walworth include HAROLD BROWN

M. P. Groom
Rockwell

J. R. Applegate
Rockwell

IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.

Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

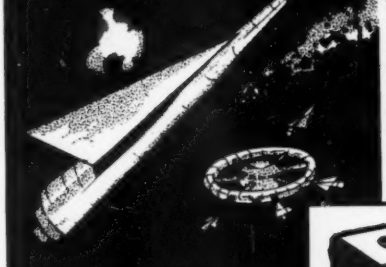
Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

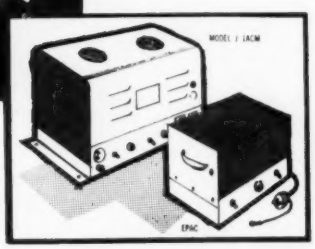
DESTINATION: TOMORROW!

OUR ROCKET SHIPS INTO OUTER SPACE WILL CARRY A T&R J/1ACM OR MODEL EPAC.



MODEL J/1ACM HOLIDAY DETECTOR WAS DESIGNED PRINCIPALLY TO BE USED AS A CONTINOUS INSPECTION DEVICE ON COATING AND WRAPPING MACHINES WHICH USE WATER FOR COOLING PURPOSES AND IN WHICH PROCESS ELECTRICAL INSPECTION OF THE PIPE IS DESIRED IMMEDIATELY FOLLOWING THE COATING AND WRAPPING.

THE J/1ACM CAN BE MODIFIED FOR USE IN CONTINUALLY INSPECTING PLASTIC SHEETS.



MODEL EPAC HOLIDAY DETECTOR IS A HIGHLY EFFICIENT AND ECONOMICAL INSTRUMENT DESIGNED PRIMARILY FOR STATIONARY COATING OPERATIONS AT YARD OR RAILHEAD OPERATIONS WHERE 110 TO 115-VOLT AC POWER IS AVAILABLE.

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Here is robust simplicity with the finest material used in each individual part: Malleable Iron lug castings ruggedly designed, 18-8 Stainless Steel band for corrosion resistance and high tensile strength, Soft Neoprene gasket for positive seal, Large Cadmium Plated steel bolt with chromate post-plate treatment. ***Quick, permanent repair.*** Simply snap on pipe, drop bolt through open-slot and tighten.

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NEW TRANSISTORIZED PIPE, VALVE AND CABLE LOCATOR

Contains many features never before found in a pipe locator:

- Single turn solid metal loops cast into the fiberglas case
- Switch on transmitter to allow for good and poor conductive ground
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- Ten transistors—7 in receiver, 3 in transmitter

Plus these other deluxe features:

- Transmitter and receiver each operate on 4 flashlight batteries—average life 1400 hrs.
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- Pulsed transmitter
- Will locate valves and pipes at greater depth and will trace pipes farther

MOST POWERFUL PORTABLE PIPE LOCATOR MADE TODAY!

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to vice president and general sales manager; FRED W. BELZ, former president, to chairman of the board; and DAVID R. POKROSS to chairman of the company's executive committee.

WILLIS R. HOWE has been promoted from assistant sales manager to sales manager of Sherman Products Inc., Royal Oak, Mich. He joined the company in 1948 as a sales representative. He held posts as zone manager and field service engineer prior to being named service manager late in 1957.

ELLO H. RICHARDSON is now vice president and general manager of the Cambridge (Mass.) **Gas Co.** With the company since 1925, he has served as superintendent of production, assistant general manager and, since 1956, as general manager.

Connecticut Light & Power Co., Berlin, has announced several promotions. STANLEY C. KILLEEN has moved to the newly created post of trade cooperation manager. JOSEPH R. CRONIN succeeds Killeen as residential sales supervisor in Meriden. In another newly created post is ELMER J. MAJOR, who is now division residential sales manager. He is succeeded as Thompsonville district residential sales manager by ROBERT S. D'VILESKIS. D'Vileskis has been in charge of the company's sales activities at Bristol. JOHN R. MCCONNELL succeeds D'Vileskis in the Bristol post.

DON WESTBO has been named manager of the rectifier division of Holcombe Co., Shreveport, La. and Calgary, Canada. He formerly was with Brance-Krachy of Houston.

Two men have been added to the sales promotion staff of Ridge Tool Co., Elyria, Ohio. JOHN R. WALL will cover Florida, Georgia, Alabama, Mississippi, Tennessee, and South Carolina, using the company's mobile demonstration

J. R. Wall
Ridge

R. W. Ifould
Ridge

wagon. The other new member of the mobile demonstration team is RONALD W. IFOULD, who will cover Quebec and the Maritime provinces.

ROBERT M. HETHERINGTON has been elected vice president in charge of operation, Iowa - Illinois Gas & Electric Co., Davenport. The former assistant to the president joined Iowa-Illinois in 1946. In 1950 he became assistant manager of the gas department. Four years later he was named manager of the department and in 1957 became assistant to the president.

Several executive changes are announced by Delaware Power & Light Co., Wilmington. H. H. PLANK, formerly president and general manager is now chairman of the board. He is succeeded by FRANK P. HYER, formerly vice president in charge of engineering, operations, and construction. HAROLD W. CLIFT was elected vice president in charge of gas and electric operations. R. B. RICHARDSON, vice president, assumes most of the other responsibilities formerly under the direction of Hyer. Other appointments include J. W. MACKIE, comptroller; H. J. PERKNER, assistant comptroller; and H. MARVIN BARRETT, purchasing agent.

ROBERT L. WHITE is the new advertising manager of Walworth Co., New York. White has been in the company's advertising department for the past eight years.

EDMUND C. AUSTIN has moved into the newly created post of vice president - procurement, for the Fluor Corp. Ltd., Los Angeles . . . Wheelabrator Corp.'s new chief engineer is HAROLD F. SCHULTE . . . Newly appointed manager of American Air Filter Co.'s merchandise division is C. A. PICKETT.

Surface Combustion Corp., Toledo, has appointed CARL W. SISCO district manager in Pittsburgh;

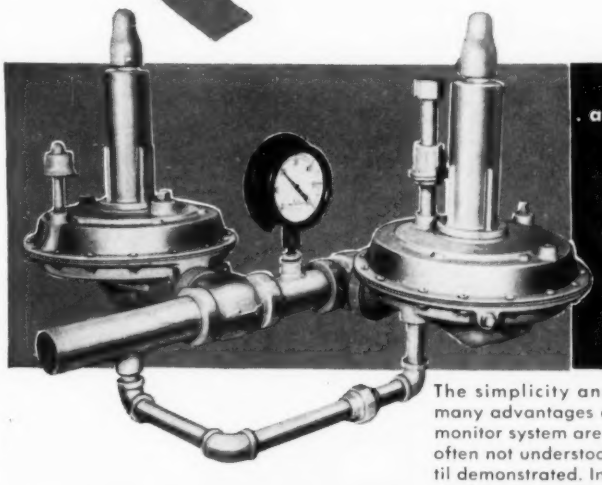
Don Westbo
Holcombe

R. M. Hetherington
Iowa-Illinois

Reynolds offer

UPSTREAM MONITORING

The monitor systems give continued regulation at a slightly higher pressure without relieving gas or shutting off the gas. This system can handle temporary or permanent failures of the operating regulator. The monitor is in semi-operation when the operating regulator is functioning properly. Therefore, you have both regulators in motion at all times. The cost of an operating regulator and operating monitor regulator is less than the cost of a regulator and a full capacity relief valve with its vent piping or the cost of a regulator and shut-off valve.



. a wide range

Reynolds is one of the principal advocates of the monitoring system. For this purpose they manufacture a wide range of monitor regulators.

The simplicity and the many advantages of the monitor system are quite often not understood until demonstrated. Inquire for demonstration model.

REYNOLDS GAS REGULATOR CO., INC.
Anderson, Indiana
A Subsidiary of Arkansas Louisiana Gas Company

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PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN USED SINCE 1897 2" HANDLE & LOCKING SLEEVE GAS MAIN STOPPER

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Koenig ALL-STEEL SERVICE BODIES

Each body electrically welded into one unit with bed reinforced. Sturdy and economical . . . weatherproof compartments with recessed paddle-handle door locks.

Write for literature on service bodies, line-construction bodies, side boxes, and King Winches.

KING WINCHES

P.T.O.-driven King Winch on Willys Jeep FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS. Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . . nothing extra needed.

A-11 King Winch on A-120 (4 x 4) International truck. There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 8,000 to 19,000 lbs.

King Winches for International trucks available through International dealers.

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Use the Heath "V" Type Survey to locate leakage

in your residential and rural areas. This Vegetation and Soil Survey gives you maximum SAFETY, plus a 3rd party Audit of your system.

Thousands of miles of American gas lines use Heath Leakage Control Surveys annually. Write for information about a "V" Type Heath Survey for your properties.

The Safety Service That Saves Gas

HEATH Survey Consultants, Inc.

378 Washington St., Wellesley Hills 81, Massachusetts

ROBERT M. SNYDER, district manager, steel mill division in Chicago; and ROBERT E. STRUTNER, sales engineer in Toledo for the steel mill division . . . CHARLES G. JAMESON is the recently appointed manager of Cook Electric Co.'s Magnilastic division . . . The Griffin Pipe Division of Griffin Wheel Co., Chicago, has made the following appointments: S. C. PREST is vice president and general manager. FRANK MAROLD is vice president-sales, and O. L. DEAN is manager of operations.

STUART A. SMITH is now sales manager of furnaces for Perfection Industries, Cleveland . . . New eastern district manager for the Metalbestos division of William Wallace Co. is HAROLD E. SWEATT. He will headquarter in Woodbridge, N. J. . . . V H SWEARINGEN has been named supervisor of sales service of the Permaglas division of the A O. Smith Corp., Kankakee, Ill.

JOY A. WEIS has joined Ohio Fuel Gas Co. as home service advisor in Marion, Ohio . . . New national advertising manager for the Norge Home Appliance division of Borg-Warner Corp., Chicago, is RICHARD C. LARKO . . . M. H. CUTLER is now engineering manager of Stone & Webster Engineering Corp. He succeeds FRED W. ARGUE, recently named executive vice president . . . TOM JOHNSON has been appointed assistant manager of the Midwest sales division of Caloric Appliance Corp. He headquarters in Des Moines, Iowa . . . Ohio Fuel Gas named ROBERT E. ROLL Bay Village local manager and A. JAMES WAITE business promotion representative in Lorain.

WANTED

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Deaths

HENRY TUTTLE, 62, president of Michigan Consolidated Gas Co., died recently in Detroit. He had been ill for five months. Starting as a serviceman in the shop department in 1920, Mr. Tuttle became president of the company in 1952. He was elected vice president and controller in 1940 and to the board of directors in 1944. In 1945 he became vice president and treasurer and in 1949, executive vice president. Mr. Tuttle was vice president, treasurer and secretary during 1948-49 of the predecessor parent company. In 1951 he was elected a director of American Natural Gas Co. He also served as treasurer of Michigan Wisconsin Pipe Line Co. from 1945-1950, vice president and treasurer from 1947-1950, and a director from 1947-1951.

EUGENE S. GEORGE, 69, a vice president and director of the Houston Natural Gas Corp. died recently in Houston. He joined the company in 1928 as an assistant warehouseman. In 1931 he became a vice president. Last January, the company's principal service center in Houston was named after him in recognition of his many years of service.

JOHN R. BIRD, 59, assistant superintendent of measurement for United Gas Pipeline Co., Shreveport, died recently in Oklahoma City. Mr. Bird was with the company for 31 years.

ALBERT M. GUTHRIE, newly appointed construction machinery general sales manager for Gar Wood Industries Inc., died recently in Pontiac, Mich. Mr. Guthrie had been with Gar Wood for 20 years and had been West Coast sales manager since 1952.

PAUL S. BARTLETT, 54, senior sales engineer for Lancaster Meter Parts Co., died recently at his home in Lancaster, Ohio. He served Lancaster Meter Parts for 13 years, playing a key role in its sales growth.

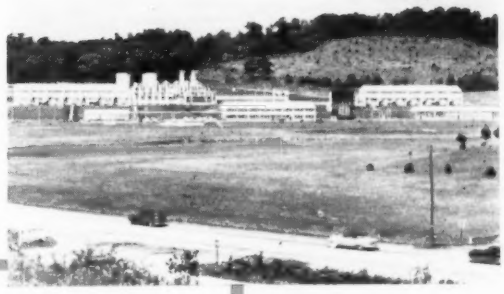
S. B. RYMER SR., 79, founder and chairman of the board of Dixie Products Inc., died at his home in Cleveland, Tenn., recently after a four-month illness. The pioneer southern industrialist established the Dixie Foundry Co. in 1916. Mr. Rymer became a leading manufacturer of wood and coal heaters and ranges and, in 1928, began production and sale of gas ranges.

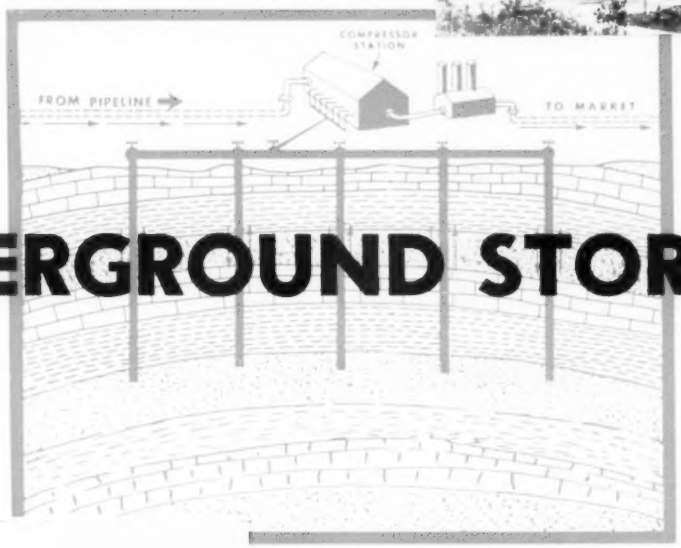
GAS

PIPELINE SECTION

In the East—OAKFORD

see page 117

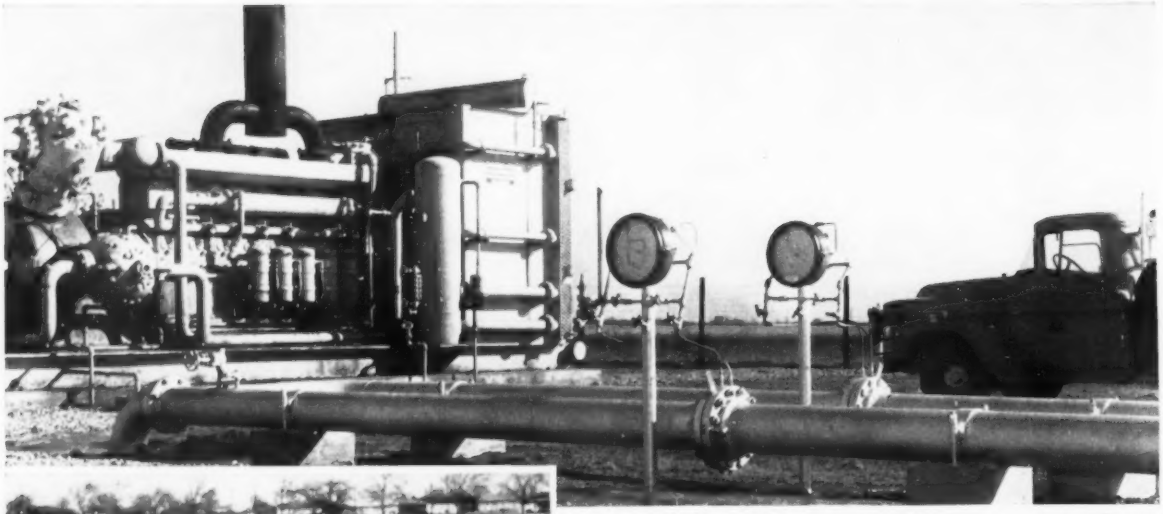




UNDERGROUND STORAGE

In the West—MONTEBELLO

see page 123



Foxboro Diaphragm Meters on gas well head measurements at Sunray Mid-Continent's Moore, Oklahoma field. Meters return to zero instantly when flow stops — have no ambient temperature effects, even though temperatures have ranged from −9°F to +105°F.

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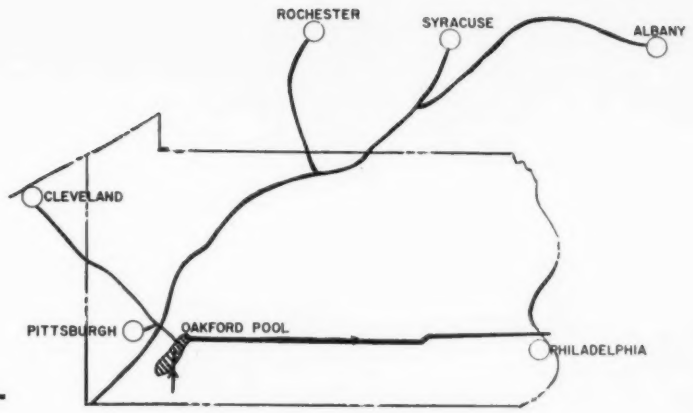


OAKFORD

Maintaining the balance between supply and demand

By JOHN W. HART, Assistant Manager, Stations
New York State Natural Gas Corp., Pittsburgh

THE Oakford storage project is a balance between supply and demand for some of the natural gas requirements of the northeastern United States. This project was developed jointly by New York State Natural Gas Corp. and Texas Eastern Transmission Corp. Each shares equally in its output.

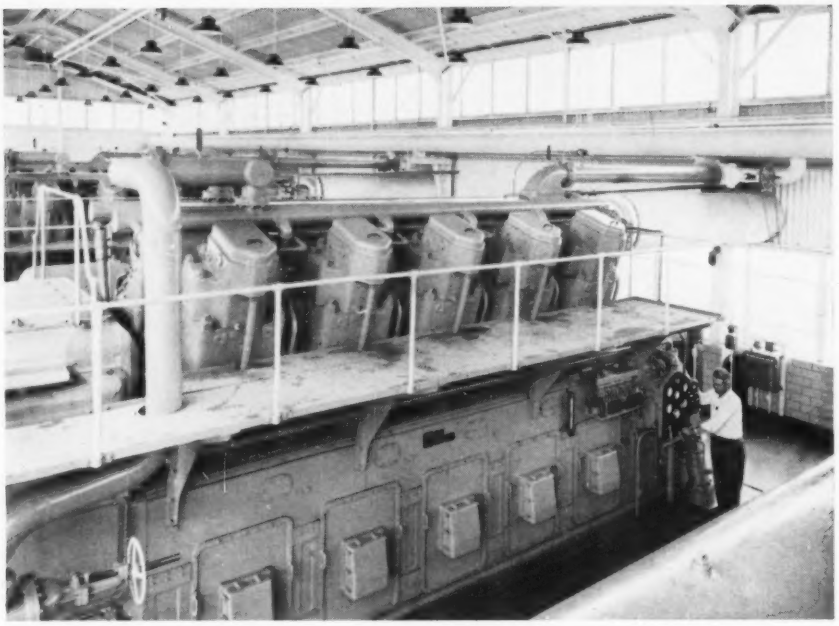
The storage area is located in Westmoreland county in southwestern Pennsylvania. Two depleted gas producing formations are used for storage. An area of 34,000 acres is under lease for storage and protective purposes. The Murrysville sand pool was one of the earliest gas pools discovered, having been initially drilled in 1878. The sand is approximately 1400 ft below ground level and is 100 ft thick. Many wells had been drilled in this formation with open flows from 10 to 40 MMcf per day, each. Original rock pressure is estimated at 600 psig.

The Fifth Sand pool was discovered in 1907. It is at a depth of 2200 ft and is about 60 ft thick. Well open flows ranged to 30 MMcf per day with a maximum rock pressure of 1100 psig.

Geological study established the suitability of these

GAS exclusive

Overall scene of Oakford compressor station.



One of the 12 GMW-10 Cooper-Bessemer compressor units.

formations for storage. The Murrysville sand pool lies on an anticline and is bounded and sealed by water. Preliminary study of this pool indicated the northern section to be separated from the southern extension by a saddle across the pool. As the wells defining the saddle had been drilled late in the production life of the pool, there was a possibility that the formation was continuous. For initial development, the pool was considered to be divided. The Fifth Sand pool is a porosity lens lying on the flank of the anticline.

The pool study indicated that the formations would hold 105,000 MMcf of storage gas. The Fifth Sand pool was to contain 20,000 MMcf of gas at 1200 psig. The Murrysville Sand was to contain 85,000 MMcf of gas. The Murrysville pool was to be used as winter supplement for steady withdrawal, while the Fifth Sand pool was to be used for peak deliveries. Of the 105,000 MMcf total storage, 60,000 MMcf was to be withdrawn at a rate averaging 400 MMcf per day for 150 days. This withdrawal was to be divided equally between the participants. Pipelines to the storage property for each party terminated at the compressor station. Gas was to be received for storage at a minimum pressure of 450 psig. Gas was to be delivered to the transmission pipelines at a pressure of 850 psig. All gas delivered was to be free of extraneous materials such as water, oil and solids to an acceptable pipeline level. Both pools of the storage project have a gas gathering system terminating in the compressor station. In operating the project, it is necessary to accurately measure the gas into and out of each pool and into and out of each transmission pipeline.

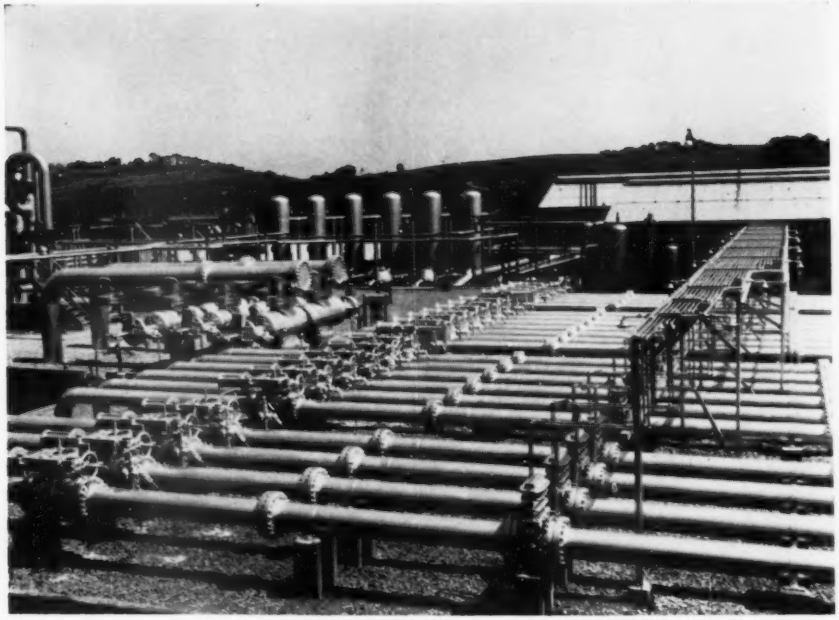
The problems in developing this pool fell into four categories:

1. *The acquisition* of necessary rights and storage leases to develop the pool.
2. *The necessity* of locating and reconditioning or plugging the old production wells.
3. *The design* of a field pipeline system to pass the required amounts of gas with economic pipeline pressure losses.
4. *The design* of a compressor station incorporating the necessary functions and capacity to operate the pool.

Engineering design did not have to consider the economic number of wells due to the large number of old wells which it was necessary to rework. Many of these wells had large open flows so that obtaining sufficient deliverability with low pressure losses was no problem. Engineering, therefore, centered on pipeline and station design. As this article is to deal mainly with station problems and design, the other problems will be covered very briefly.

Since all the old wells in the pool had to be located so they could be either reconditioned for storage or plugged, a very difficult problem was posed. Due to the age of the pool, information concerning old well locations was very scarce. Bulldozers were used to remove earth at suspected locations where often nails used in wooden rigs or drilling sludge would confirm the presence of a well. Information from old-timers in the community also helped establish locations. Mine detectors, soil samples, old literature and maps helped in locating wells. To date, 363 wells have been re-worked. Of these, 269 have been retained as active storage wells.

A 6-in. lead line from each well is connected into a drip adjacent to the well and from the drip the lead line is tied into an orifice meter run. The line from the meter run is connected into the main trunk or gathering line. The main trunk line is 20-in. with secondary lines 8-, 10-, 12- and 14-in., depending on the volume of gas they are required to handle. Drips



Orifice meter runs with gas cleaners and meter building in the background.

were installed so that entrained water would have ample opportunity to fall out. Lead lines were sized to reduce friction and obstructions so that hydrate formation might be kept to a minimum at the pressures and temperatures involved.

The two storage sands were to be operated independently and at different pressures. The Fifth Sand capacity, being approximately one-fourth that of the Murrysville, was to be kept at a high inventory so that a high delivery would be available for peak demands.

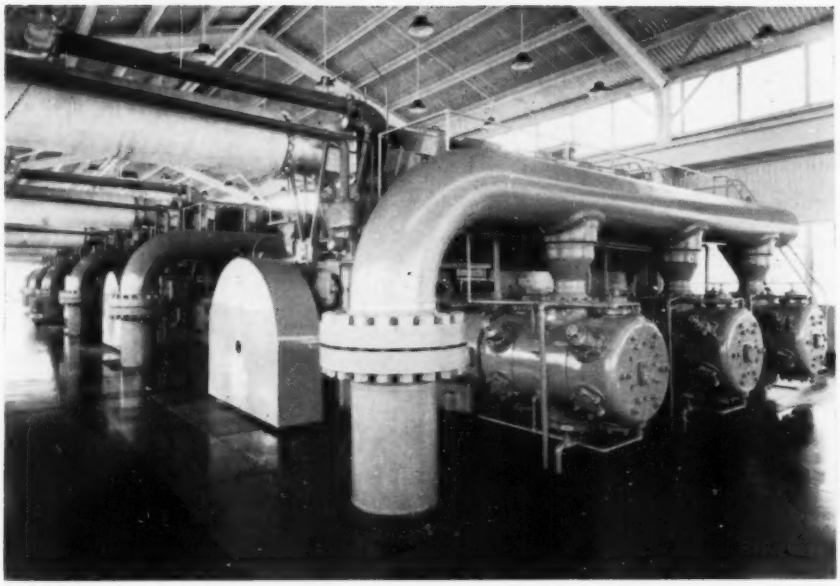
In light of the foregoing, a compressor station was required that would accomplish the following flowwise:

1. *Injection*
   (a.) Store gas naturally from either transmission line into either or both storage pools.
   (b.) Pump gas either single-stage or two-stage into the Fifth Sand and store naturally in the Murrysville Sand from either transmission line.
   (c.) Take gas from one transmission line, feed part of it to the other transmission line and store the remainder naturally in either or both pools or store naturally into Murrysville and pump in the Fifth.
2. *Withdrawal*
   (a.) Feed naturally from either or both pools to either or both transmission lines. However, under established operating conditions, present pressures in the Murrysville Sand are not high enough to permit natural flow, and all withdrawals from this formation must be pumped.
   (b.) Pump from either or both pools to either or both transmission lines.
   (c.) Pump either single or double-stage from Murrysville Sand to either or both transmission lines and at the same time pump triple-stage from the Murrysville to the Fifth Sand.

The original compressor station design was based on the following:

Minimum pressures to the station from the transmission lines	450 psig
Maximum discharge to the transmission lines	850 psig
Minimum pool pressures	150 psig (Murrysville)
	400 psig (Fifth)
Maximum discharge to pool.....	850 psig (Murrysville)
	(Fifth)
Maximum flow to or from pools,	400 MMcf/day

To do the job, 12 2500-hp Cooper-Bessemer GMW units were selected. Five units were equipped with $13\frac{3}{4}$-in. cylinders and seven units with 14-in. cylinders sized for a suction of 150 psig and a discharge of 850 psig. The compressor cylinders are equipped with valve lifters so that the cylinder displacement can be adjusted to load the engines at various pressure conditions. To overcome the pulsation problem due to the wide range of operating conditions and engine speeds, a two-bottle-type Fluor pulsation dampener was used on the compressor discharge. The compressor units are housed in two separate compressor buildings, 15,000 hp in each, as a safety factor. Practically all the valves in this station are motor-operated due to the time and labor required to operate them by hand, as they are mostly large size gate valves, the only kind then available for the size and pressure involved.



Interior of No. 1 compressor building showing six 2500-hp compressor units.

For cooling the hot discharge gas, 24 fin tube sections were installed with forced air as the heat transfer medium. Constant speed electric motor-driven propeller-type fans circulate the air.

The jacket water system for compressor units and engine generator units was designed on a full flow system. That is, all the water passes through the coolers and is cooled to a pre-determined temperature. For this purpose, 20 fin tube sections with forced air circulation were selected. The propeller-type fans for this unit are driven by a hydraulic motor which is of variable speed. A constant output oil pump is electric motor-driven and the oil from the pump to the hydraulic motor is varied by a regulator and temperature controller which gets its signal from the effluent of the cooling sections. Average temperatures to and from the cooling sections are about 170 and 155 degrees F, respectively. The cooling sections are sloped and each valved separately so they may be drained when not in use in cold weather. Also, half the sections are equipped with hand-operated louvers for additional protection in winter during light loads.

Cooling water for compressor cylinder jackets and oil coolers had to be at a lower temperature than the hot system. Since sufficient water was available for evaporative cooling, bent tube sections in the base of an induced draft cooling tower were utilized. Direct air cooling for an approach of 115 degrees F to atmospheric temperatures was not economical.

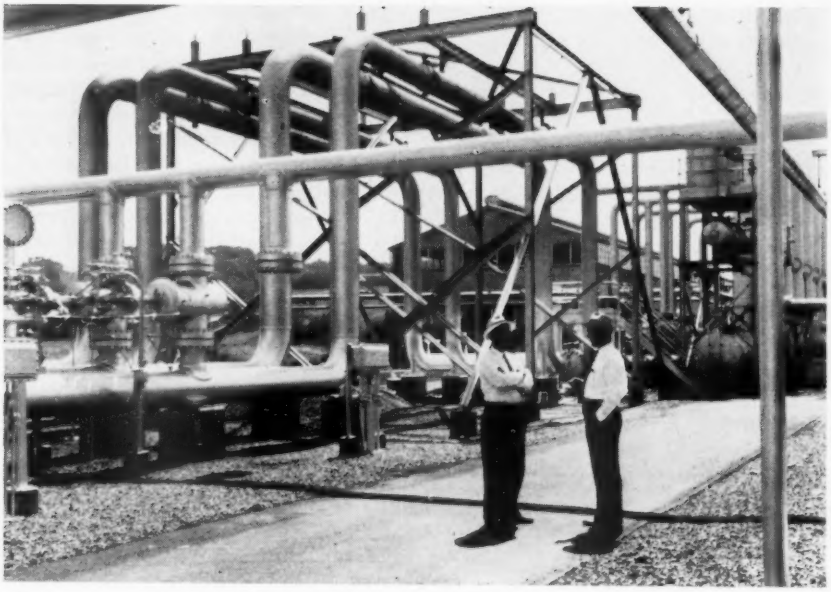
The station is self sufficient as far as electrical power requirements are concerned. Three 1400-hp Worthington super-charged engine generator units were installed to provide three-phase alternating current. Each generator is rated at 1000 kw. The power distribution panel is of the totally enclosed dead front type.

When expanding the gas from the 1200-psig Fifth Sand pool to pipeline pressures, hydrates are likely to form. To prevent this, a shell and tube type heater was installed to heat the gas before pressure reduction. Steam for this heater and for building heat is furnished by two packaged boilers, each with a capacity of 14,100 lb per hour of steam at 100 psig.

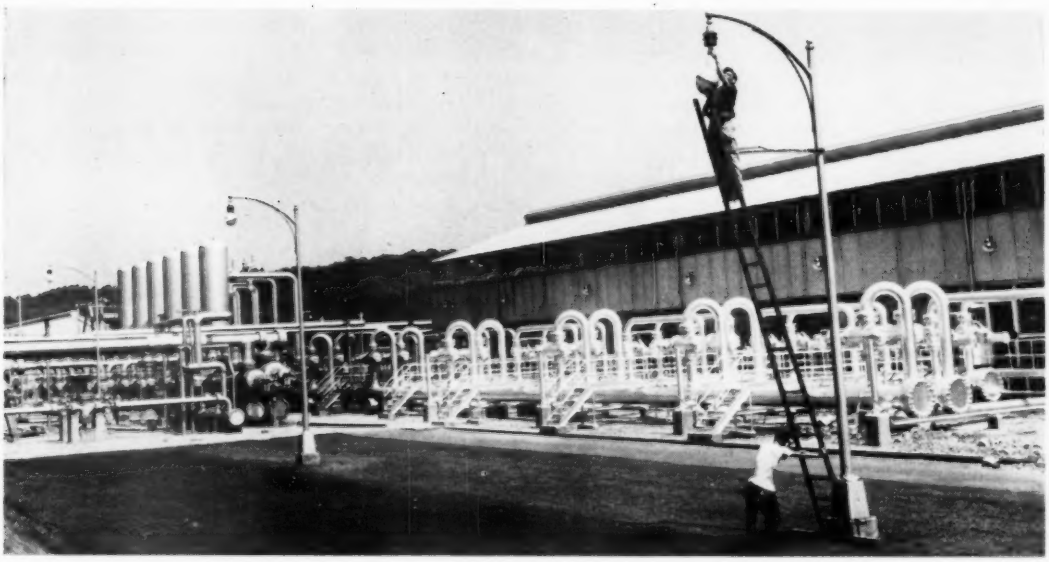
As the gas coming from the storage pools and transmission lines is usually wet, it is necessary to dehydrate it at the station. A solid type plant was selected, using Sova beads, because of the lower dewpoint depression obtainable over that of the glycol type plant. The operating cycle of the plant is conventional with two exceptions.

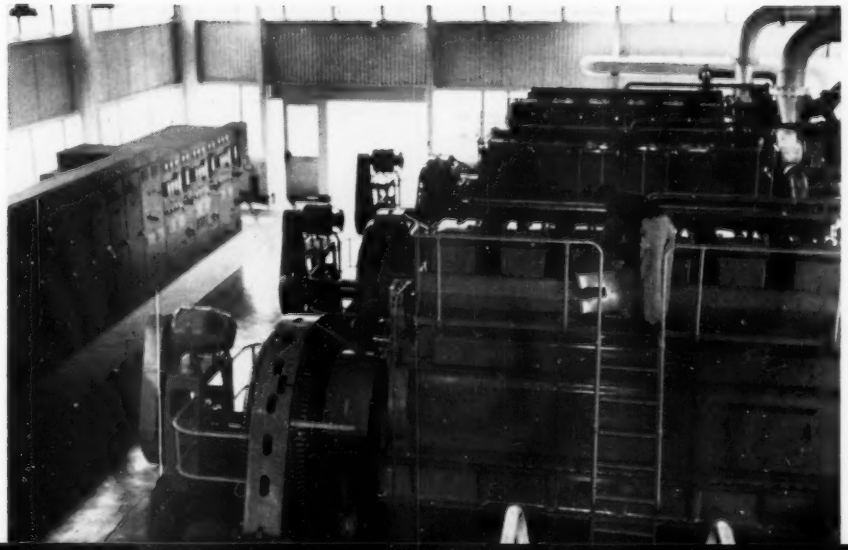
Normally, regeneration gas drive is obtained by creating a differential pressure on the main stream of gas sufficient for regeneration gas circulation. However, it was found that there was a considerable waste of horsepower if a differential was held on the total stream. Therefore, a 110-hp Ingersoll-Rand engine compressor unit is used to circulate regeneration gas. This is also advantageous from the standpoint that if all flow in the station is suddenly terminated, it is possible to dry the wet beds with no main stream flow. Secondly, the plant is designed for continuous automatic operation by a timer control panel. The towers are unconventional in that the gas passes from the top and bottom inlets to a center outlet connection, the desiccant bed being supported only at the bottom. The dry gas leaves through a perforated annular ring at the center of the bed. In this system, there is no chance of the bed lifting with consequent dusting and breaking of the desiccant. Six towers were installed. Four towers dehydrate continuously while two are being regenerated. Each tower is designed to dehydrate gas at the rate of 100 MMcf per day for a period of eight hours to a dewpoint of 0 degrees F or less. All valves are electric motor-operated plug valves.

An emergency shutdown system was incorporated



Suction and discharge headers have bends to prevent damage from expansion and contraction of pipe.





Above: The 20-in. and 24-in. suction and discharge headers run parallel to both compressor buildings.

The auxiliary building houses three 1000-kw engine-generator units.

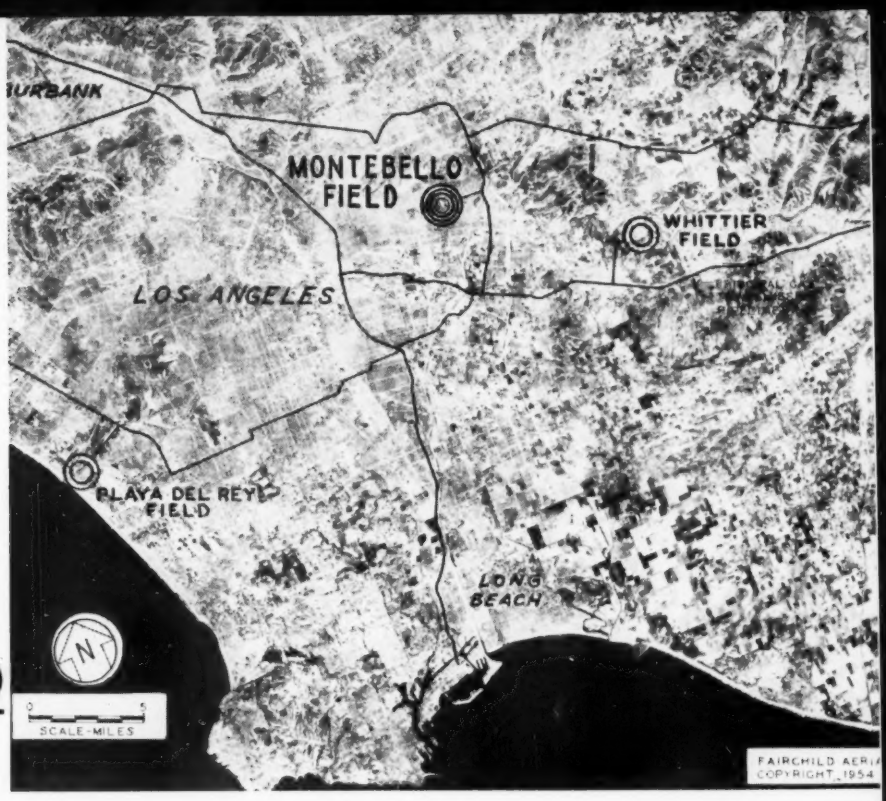
into the station to automatically close all fire-gates and shut down all engines. Separate air storage tanks in the fire-gate area contain sufficient air to operate these gates. Shutdown switches are located at each end of both compressor buildings, the meter building and the auxiliary building.

After a period of operation of the station and storage pools, several problems were brought to light. As stated previously in this article, the Murrysville formation was considered to be divided, but operation proved otherwise. Migration of gas to the southern extension of the Murrysville Sand increased the volume of this pool. With this development, and since the volume of gas to be stored in the formation would remain the same, this would mean that the pool would have to be operated at lower pressures. This resulted in a lower maximum discharge to the pool in injection and a lower minimum suction from the pool during withdrawal. From this standpoint, a greater displacement would be required for the station compressors. Four engines which previously had 14-in. compressor cylinders were fitted with 24¾-in. cylinders designed to load fully with a suction pressure of 50 psig. These cylinders were equipped with head end unloaders and suction valve cap unloaders. Because of the higher compression ratio, an extra cell of four sections was added to the gas coolers. During winter operation, the need was seen for more control of gas temperature from the coolers as hydrates form should the gas be cooled too much. Fluid drive units were installed between the constant-speed motor and the fan of the coolers. These units had a constant-speed input and a variable output which was controlled by the temperature of the effluent gas.

The orifice meter runs measuring gas in and out of the station were fitted with plug valves with pneumatic cylinder operators that could be inched to control flow by electric push button control. It was difficult to get minute adjustments in flow because when enough pressure was admitted to overcome the friction of the piston, or a stuck piston, the expansion of the air would cause too great a movement of the valve plug. Four-way, three-position valves using oil under pressure from an air-hydraulic pump solved the problem.

Today, advancement in equipment design and engineering is being taken advantage of. For instance, one closed water system usually serves all cooling requirements. The heat exchanger involved is usually a forced draft type with coiled sections. In this manner, only a portion of the entire water flow is cooled to a temperature of about 120 degrees F which is necessary for lube oil coolers and compressor cylinders. This 120-degree F water, after it has picked up a few degrees from oil coolers and compressor cylinders, is usually blended with hot water coming from the engine (about 170 degrees F) by a temperature control valve to send water to the engine of about 155 degrees F. Thus, only a portion of the total flow is cooled from 170 to 120 degrees F. This method eliminates need for excessive make-up water as is needed in an evaporative cooling system. Also, the steps toward automation will decrease the operating crew necessary. ■

This control well, overlooking Oakford station, observes pressures near perimeter of fifth sand in storage area.



MONTEBELLO

Gas storage under a metropolitan area

By J. H. N. ELLIS and T. C. McLEAN
Pacific Lighting Gas Supply Co., Los Angeles

ALL of us in the natural gas business are aware of the vital and important part that underground gas storage plays in a natural gas system. Most of our gas consuming areas are quite remote from the source of supply, making it economically unfeasible to install pipeline capacity great enough to provide for peak demands.

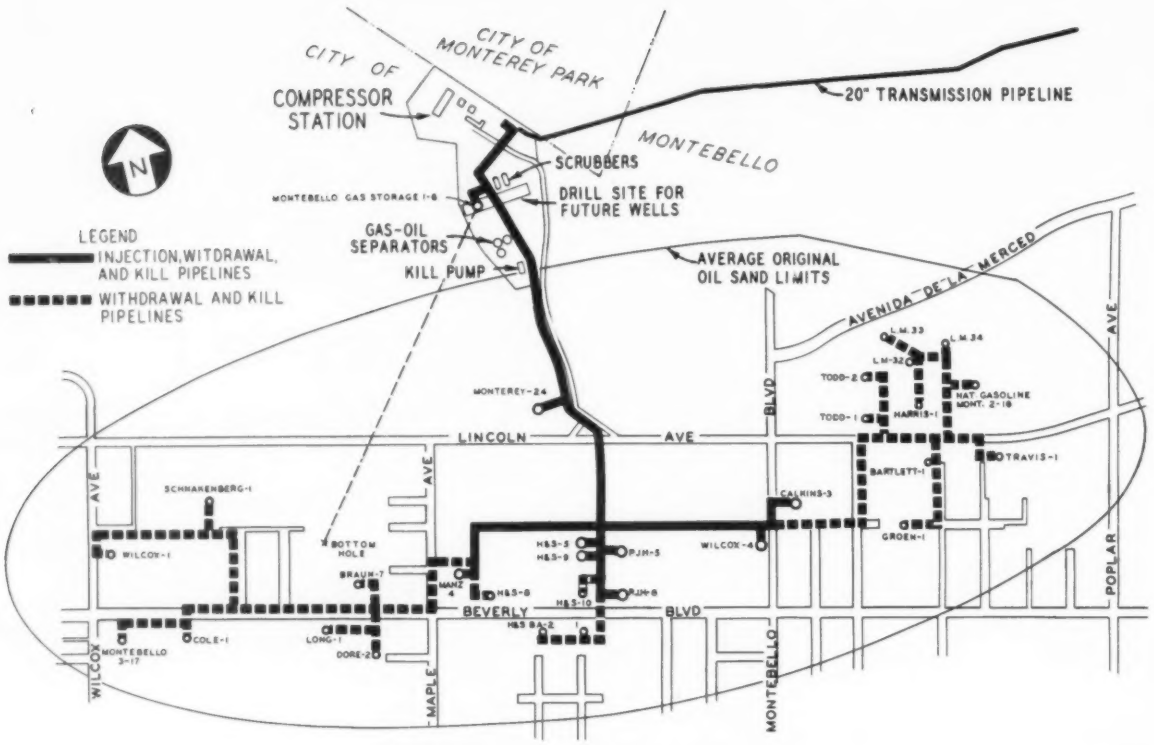
We in southern California have gone from a time in which the supply of natural gas was far in excess of demand—when during the flush period large quantities of gas were wasted—to the present when a rapid population growth and declining oil field production make necessary importation of 75 per cent of the gas consumed from out-of-state sources.

During World War II it became evident that it would be necessary to bring out-of-state gas to California to satisfy the ever-increasing demand. Out-of-state gas first entered southern California in 1947, with initial deliveries of about 125 MMcf of gas a day. At present, the Pacific Lighting group is importing about 1.04 billion cu ft of gas per day, and is waiting on approvals by regulatory agencies to increase the daily imports to nearly 2 billion cu ft a day by 1962.

All of this means that more underground storage is required to enable us to meet peak-day and peak-hour loads. Our peak-day requirements are more than seven times greater than our average daily needs while the peak-hour sendout is double the daily rate of the peak day.

The Pacific Lighting system is composed of Pacific Lighting Gas Supply Co., Southern Counties Gas Co., and Southern California Gas Co. serving all of southern California with the exception of San Diego county and the city of Long Beach. San Diego Gas & Electric Co. serves all of San Diego county but purchases all of its gas from our group of companies. Long Beach has a municipal system but purchases

This article is adapted from a talk presented at the AGA transmission conference, held in Dallas in May.



Principal facilities at the Montebello gas storage field.

part of its gas from our companies.

At present, the Pacific Lighting system operates four underground gas storage projects at Goleta, Playa del Rey, East Whittier, and Montebello.

Our latest storage project is the Montebello field, located within the city of Montebello adjacent to the city of Los Angeles, about 10 miles east of the Los Angeles civic center. With the rapid inter-urban growth that southern California has experienced in the last 15 years, it is difficult to separate the many individual cities. Their boundaries are contiguous, and the urban development is continuous, so that we have a vast, inter-connected metropolitan area near the center of which is Montebello.

So that you may better understand the problems that confronted us at Montebello, I will give you a brief review of the history of the field, its development, and geology before presenting the facts on the actual development of the field into a gas storage project.

• History of field

The discovery of the West Montebello field in 1936 was the result of a westerly step out from the Old Montebello field, discovered in 1917. Monterey No. 20, the discovery well, was drilled into what is now known as the second zone. Subsequent drilling opened up lower producing zones and in April 1939 Union Oil Co.'s La Merced No. 30 well found production in the eighth zone which we are presently using for gas storage.

La Merced No. 30 had an initial production of 710 bbl of oil per day along with a great deal of gas, of which no record was kept. Later the well was drilled deeper into the ninth zone, this being the deepest zone from which production has been obtained.

Following these early explorations there was frenzied development of the rest of the field. With the field located within the limits of the city of Montebello, a typical uneconomical town-lot development was underway. At this time, no consideration was given to unitized operation so it was a case of each small land owner trying to get his share first as well as having the chance of drawing off some of his neighbors' production if the latter was slow in developing it.

During this disorganized development it has been estimated that 21,848 MMcf of gas was blown to the air. Average daily oil production in two months' time increased from 10,000 to 24,000 bbl per day.

In June 1939 the State of California put into effect an injunction limiting oil production to a maximum of 250 bbl per well per day. After curtailment the Montebello oil production leveled off so that a more normal oil production decline curve could be developed. Average production from the 200 wells dropped from 120 bbl of oil per day to 60 bbl of oil per day. In 1955, after a normal decline, the production from 72 wells was down to an average of 12 bbl per day per well.

As development slowed down it was possible to bring about a small amount of consolidation of operations. Union Oil Co., being the most aggressive, was able to obtain about 26 per cent of the produc-

tion As production declined, Union Oil started considering secondary recovery in the eighth zone, either by water flooding or repressuring with gas. It was at this point that Pacific Lighting entered the picture and a gas storage project was developed.

Up to the time that injection of cushion gas into the eighth zone was started in August 1956 the cumulative production from the eighth zone had been:

8.5 million bbl of 35° gravity oil
1.8 million bbl of water
39 billion cu ft of gas

and it was estimated that there was remaining:

2 million bbl of oil
4 billion cu ft of gas

A total of 174 wells had penetrated into the eighth zone by 1956 and 98 of these had been abandoned.

• Geology and structure

The West Montebello field is an elongated dome having the long axis trending slightly south of east and north of west and its axial plane slightly tilted to the south. Nine different zones have been tested and with the exception of the first zone all have been productive to some degree.

The eighth zone is made up of three subzones known as 8^{-1}, 8^{-2}, and 8^{-3}, and is part of the Puente formation of upper Miocene age. The productive subzones are made up of firm, fine to medium grained and often shaley sands which are separated by shales and sandy shales. Porosity of the sands ranges from 21 to 24 per cent, and the permeability ranges from 0 to 151 millidarcys.

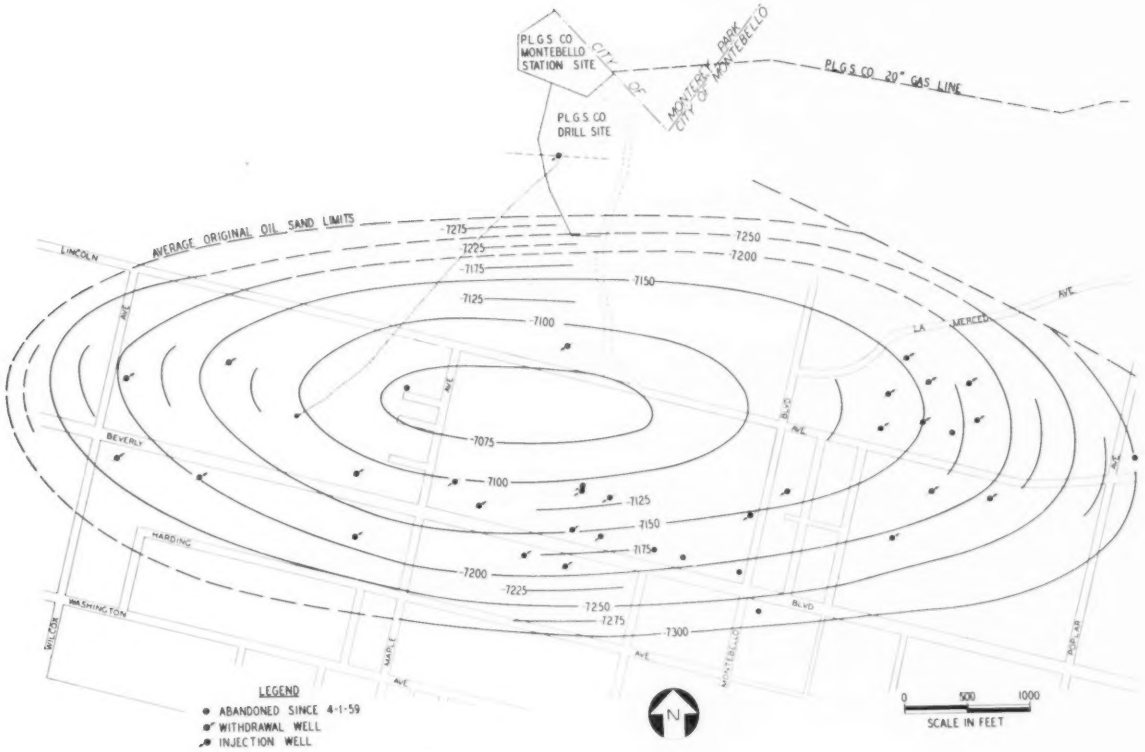
Subzone	*Sea Level to Top of Subzone*	*Average Thickness of Subzone*	*Closure*
8^{-1}	7350′ to 7550′	100′	250′
8^{-2}	7490′ to 7650′	124′	250′
8^{-3}	7625′ to 7800′	70′	250′

• Growth of ideas

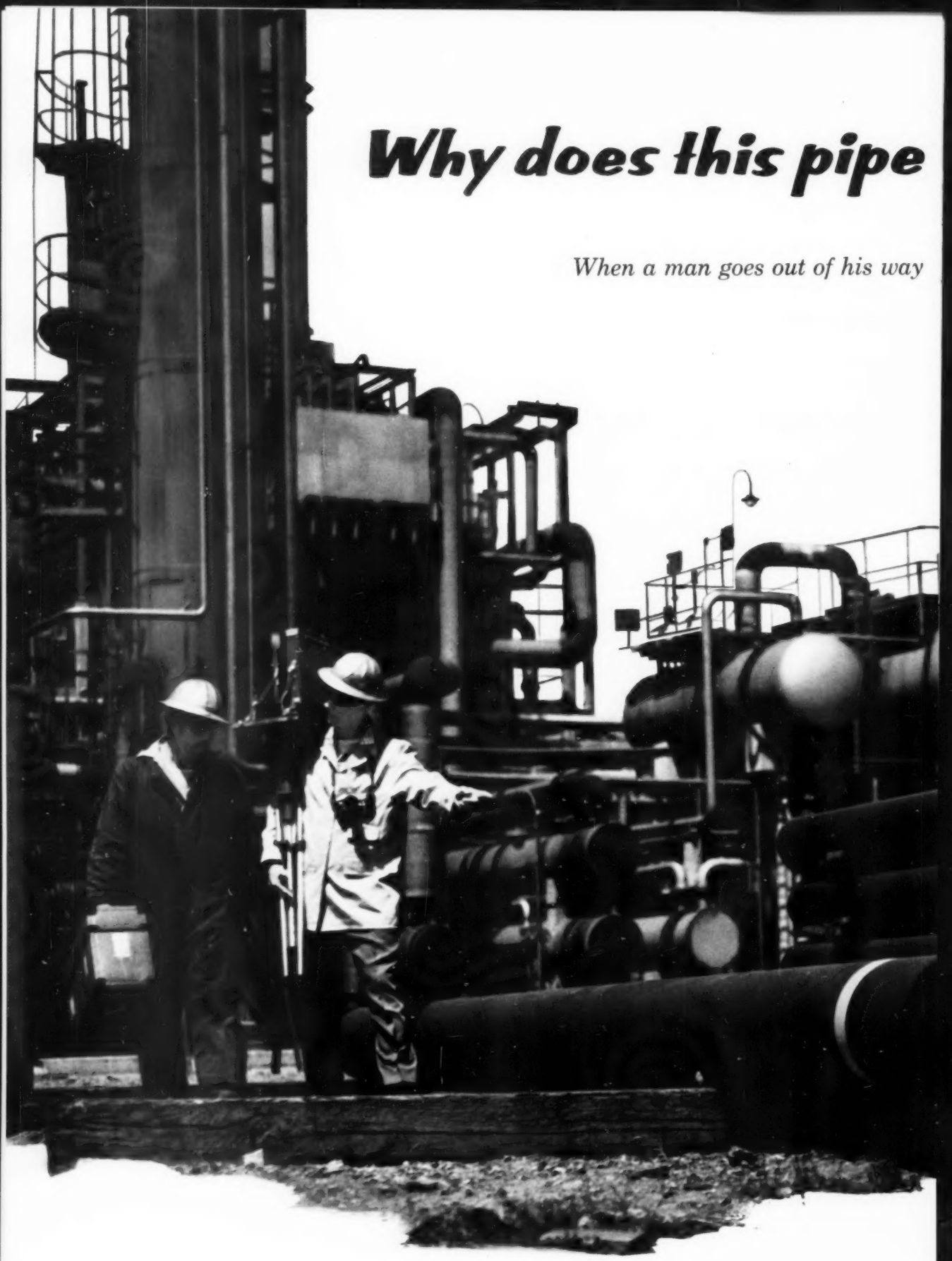
The development of the Montebello project is actually the culmination of two companies' desires and planning. First, the desire of the field's major operator to start a program of secondary oil recovery in the eighth zone of the Montebello field and second, the need of Pacific Lighting Gas Supply Co. for additional underground gas storage, particularly in an area so near to the center of demand.

In 1949 discussions between Union Oil and PLGS were started and finally culminated in an agreement and the start of construction on April 1, 1956, and the start of injection of gas into the eighth zone on Aug. 15, 1956. We began withdrawal in 1958.

During the nine-year period many details had to be worked out with the various operators, property owners, lessors, lessees and the city of Montebello. Over 530 parcels of land within the 544-acre limits of the field owned by over 800 people had to be brought into the plan as well as 12 different oil companies. There was also the necessity to obtain a certificate



Generalized contours, top of 8-ft sand



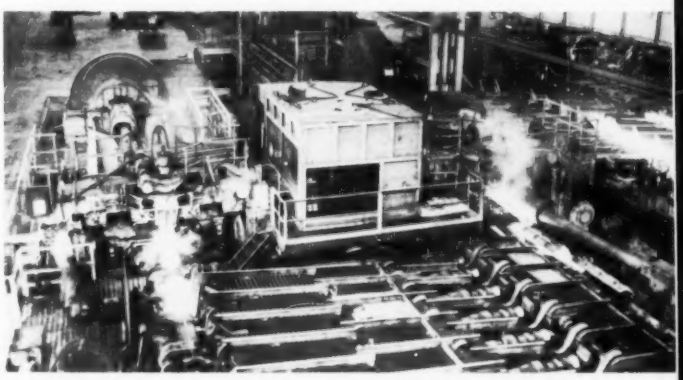
Why does this pipe

When a man goes out of his way

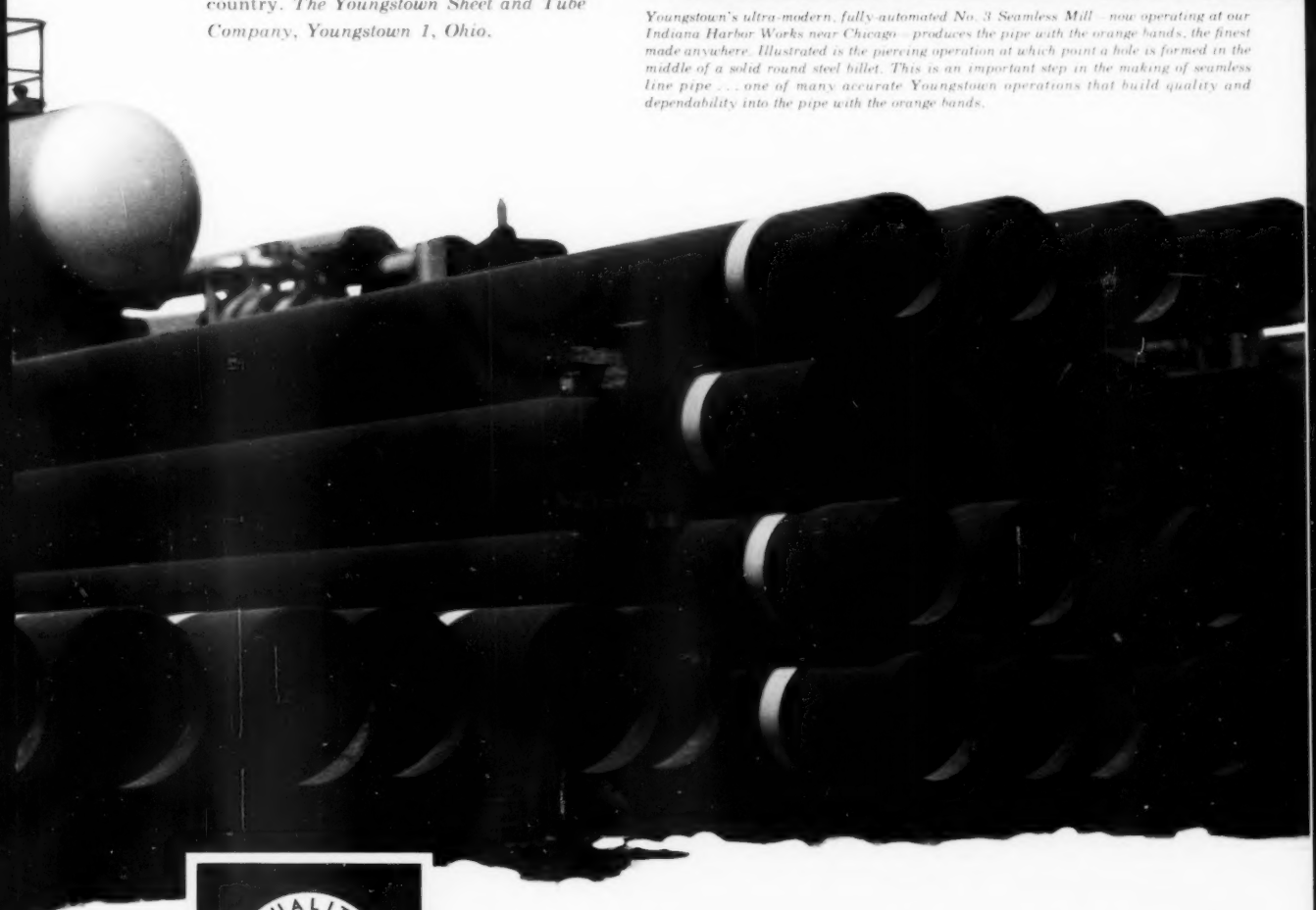
have an Orange Band?

to make a superior product...

he likes to brand it. This lets people know the quality they're getting. The orange band marks Youngstown seamless line pipe . . . the finest made. This high-strength, uniform quality seamless pipe is furnished with ends threaded, grooved, or plain end bevelled for welding and for various mechanical couplers. To obtain more information about Youngstown Line Pipe, contact our sales and service offices throughout the oil and gas-producing country. *The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.*



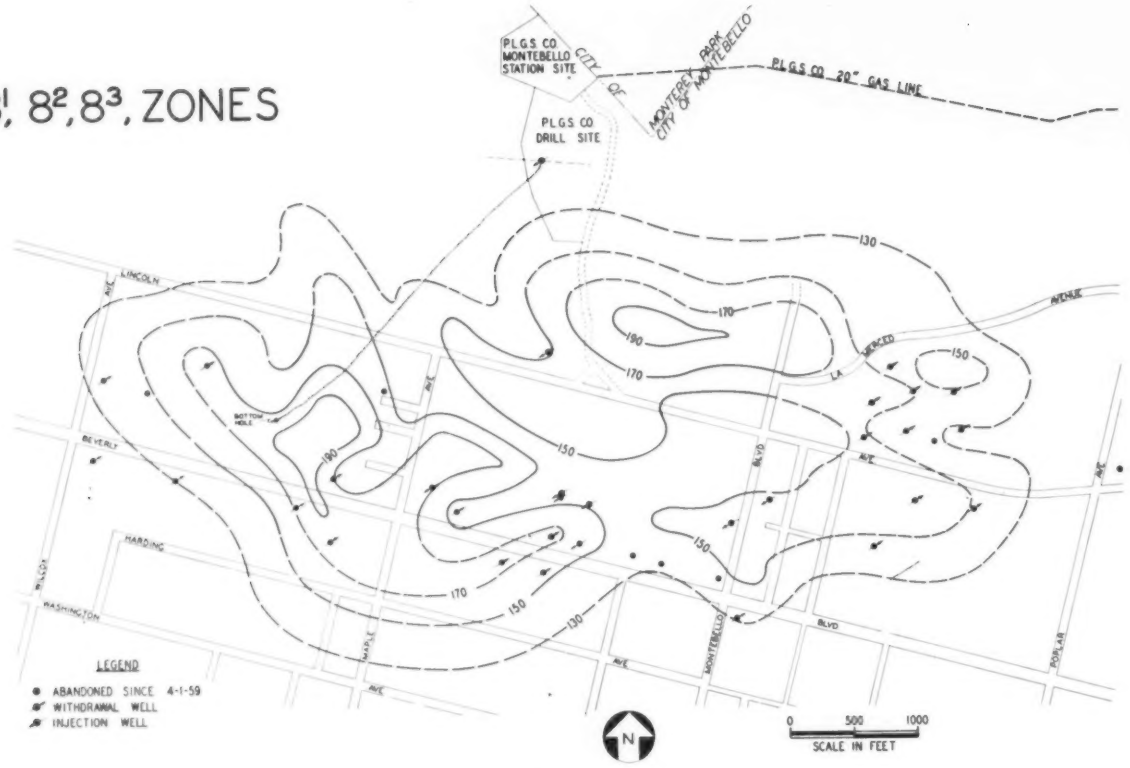
Youngstown's ultra-modern, fully-automated No. 3 Seamless Mill — now operating at our Indiana Harbor Works near Chicago — produces the pipe with the orange bands, the finest made anywhere. Illustrated is the piercing operation at which point a hole is formed in the middle of a solid round steel billet. This is an important step in the making of seamless line pipe . . . one of many accurate Youngstown operations that build quality and dependability into the pipe with the orange bands.



QUALITY YOUNGSTOWN SERVICE

Youngstown

SEAMLESS LINE PIPE



Composite Isopachus map.

of public convenience and necessity from the California Public Utilities Commission.

• **Development of plan**

Prior to completion of the Pacific Lighting-Union Oil agreement, a detailed study of all available information on the field and its development was made. There were two pilot injection runs, the first during the period, Jan. 27, 1952 to April 21, 1952, when use was made alternately of La Merced well No. 32 and Wilcox No. 4. During this first test 40 MMcf of gas was injected. Observation wells around the injection wells experienced pressure buildup the second day of injection. A second brief test was made in the period of May 31, 1955 to June 24, 1955 when P. J. Howard No. 5 well was used as an input well. At that time 74 MMcf of gas was injected. The tests indicated the ability of the zone to receive injected gas satisfactorily and from the data injectivity curves were developed for the wells tested.

The agreement and final contract entered into with Union Oil Co. set Union up as the operator of the field and our company as the operator of the compressor station and dehydration facilities. This split of operations was based upon the fact that estimates indicated that there was remaining in the eighth zone, 2 million bbl of oil and 4 billion cu ft of gas. To purchase this oil in place from the operators would have represented a considerable cash outlay and to enter into an oil production activity would have been stepping out of our normal business of gas transmission and storage.

Union set up an "Eighth Zone Oil Pool" composed of all operators producing from the Eighth zone. It also negotiated most of the storage agreements with a few exceptions handled by Pacific. In some cases this meant the actual acquisition of gas, oil and storage rights by either Union Oil Co. or Pacific Lighting Gas Supply Co.

Participation in the oil production pool by the various lessors and operators is based upon two factors: (1) The total amount of oil produced from the eighth zone during the six-month interval immediately prior to the start of injection; and (2) the percentage of this total that their well or wells contributed to the total production during the six-month period is their percentage of participation in the remaining eighth zone oil production.

For gas storage in the eighth zone Pacific pays to Union an annual storage fee based upon the volume of gas withdrawn from storage during the year. Union in turn pays the storage rights owner his proportionate share based upon his percentage ownership of the total eighth zone reservoir. In all cases a minimum fee is paid. Union is also paid a fixed annual service fee.

The agreement also provides for Union Oil Co. to perform all well workovers, well abandonments, drill new wells, install field lines, oil separation equipment, oil storage, waste water storage and incidental field installations. All of the preceding work to be done at

Pacific's request or approval, and at Pacific's expense, except for the installations and work performed for oil production only. In this case the expense is borne by the eighth zone oil operators' pool.

A problem that confronted us was the zoning ordinance of the city of Montebello which prohibited the drilling of new wells or the installation of compressor facilities in any portion of the field except for the extreme northerly portion north of Lincoln boulevard. We had to obtain a special use permit to build and operate the compressor station and drill future wells. Within the approved area and in the hills north of the city proper were the remains of a decomposed granite quarrying operation that had been carried on over 35 years. The operation had left two large excavated benches surrounded by near vertical banks up to about 75 ft high. These areas were well suited for our operation since they afforded a natural screen from the city below and an ample area for our installations. The two benches were purchased and have subsequently been named the 7-acre parcel or compressor station site, this being the most northerly parcel and the highest in elevation. Immediately south and at a lower level is what we call the drill site or 14-acre parcel.

At the time we were asking for a Special Use Permit from the city of Montebello we had considerable opposition from people in the immediate area and in particular from the realty interests. Field development up to this time had created many eyesores for a community that wanted to expand its residential areas. Naturally, they envisioned our operation as a continuation of the type with which they had become familiar.

A prospectus of our plans was presented to all concerned and the community was assured that we would have all existing derricks over eight zone wells removed, all oil storage tanks, wash tanks and aboveground lines serving eighth zone wells removed, all injection wellheads set below ground level, all wellheads fenced in and screened by planting. These things have been done and the people who fought the project the most strenuously are now our supporters.

Since our clean-up program many of the areas have been sub-divided and new homes have been built. A new civic center is to be built practically in the center of the field. While all of this adds to our operating difficulties, it does aid us in our public relations job.

- **Building of facilities**

With the completion of negotiations, the receipt of all necessary permits, approvals, and the purchase of the 7- and 14-acre parcels, work in the field and compressor station was started on April 1, 1956 as per design and plans worked out prior to the completion of the negotiations, etc.

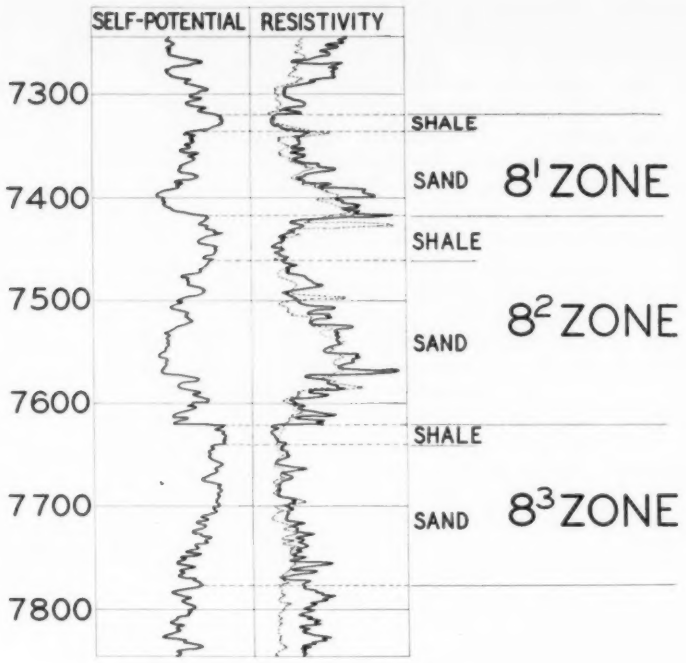
The design was based upon the following:

1. Daily injection of 65 MMcf of gas with intake pressures ranging from 225 to 400 psi, and discharge pressures up to 3500 psi.
2. Daily withdrawal capacity of 200 MMcf of gas with scrubber, regulation, dehydration and odorizing facilities to condition gas for delivery at a maximum pressure of 465 psi into the Southern California Gas Co.'s 30-in. loop system.
3. An annual storage cycle of 12.5 billion cu ft of gas.

Union Oil Co.'s field work consisted of:

1. Conditioning of six central wells for injection which entailed the removal of the old 3000 psi wellheads; the installation of protective casing strings of 5½-in. 17-lb J-55 extreme line casing with a packer set in the 7½-in. casing 5 ft above the liner hangers; the installation of new 5000 psi wellheads in new concrete cellars so that wellheads would be below ground level.

Installing new 42-ton scrubber unit at Montebello takes massive equipment. Scrubber and other new equipment help increase Montebello's withdrawal capacity from 200 MMcf to 250 MMcf daily.



Type electric log of Montebello storage field.

2. Blanking off upper zones or lower zones in 3 wells and cleaning out perforations into the eighth zone.

3. Plugging casings in the eighth zone of 16 wells also open to upper zones.

4. Abandoning 13 wells.

5. Re-entering one abandoned well which had a questionable abandonment and reabandon. Located over this well was a residence which was bought and moved by Pacific in preparation for the reabandonment.

6. Testing and squeezing water shutoff holes in casing above the top of the 8^{-1} sand in 16 wells.

7. Servicing 30 flank or periphery wells to be used for gas withdrawal and oil production. These wells were equipped with pump jacks or Kobe units.

8. Removal of all gas traps, wash tanks and oil storage tanks that were located in the field and were serving eighth zone wells.

9. Installation on the south end of the drill site area of a central gas trap, wash tank, oil storage tank and vapor recovery set up to handle all eighth zone oil production.

10. Removal of 10 wood and 18 steel derricks over eighth zone wells.

11. Installation of 6695 ft of 4-, 6-, and 8-in. injection line between the compressor station and six injection wells. The line was designed for 3500 psi service.

12. Installation of 22,580 ft of 4-, 6-, 8-, 10-, and 20-in. withdrawal line between the compressor station and the 36 eighth zone wells, including both injection and withdrawal wells. This system was designed for 1000 psi service.

13. Installation of 22,360 ft of 3-in. kill line between the tank site and the 36 eighth zone wells. This system was designed for 4500 psi service.

14. Installation of a high pressure oil well cementing pump and 1000-bbl salt water storage tank to be used in conjunction with the kill line of use in killing wells for workover or emergencies.

15. Installation of scrubber facilities to remove free liquids from the gas stream before they enter the dehydration area when gas is being withdrawn.

16. General clean up, fencing and landscaping around all eighth zone well heads.

Pacific Lighting Gas Supply Co.'s work consisted of:

1. Installation of an 8100-hp compressor station using six 1350-hp Cooper-Bessemer GMVA-10 compressor units for two-stage compression.

2. Installation of auxiliary equipment consisting of: 3 187 KVA generators driven by 155-hp Waukesha engines; 4 air cooled, motor driven fan cooler units for cooling gas, jacket water, and lube oil; 3 motor driven jacket water pumps; 2 motor driven lube oil pumps; and 2 air compressors.

3. Installation of tri-ethylene glycol dehydration unit.

4. Installation of metering, regulating, scrubbing, and odorizing equipment.

5. Installation of two Waukesha powered water pumps for fire protection system.

6. Four concrete block buildings consisting of compressor building, fire pump and storeroom building, car port, auxiliary, locker room and field office building.

7. Reconditioning a previously converted oil well to a water well for water supply to compressor station.

8. Installation of 9000 ft of 20-in. line between compressor station and Southern California Gas Co.'s

30-in. loop system line east of the station. Maximum operating pressure is 465 psi.

• Work performed since start up

As previously stated, the compressor station was put into operation on Aug. 15, 1956, and the injection of gas into six injection wells was begun.

It was early noted that the gas was spreading throughout the formation faster than had been anticipated. As the formation pressure increased two wells developed casing leaks in upper zones. Because these wells were not important to the project, they were abandoned.

During the initial well workovers it was noted that some of the casings were in questionable condition. With this information plus two casing failures a restudy of well histories was made. At the same time a study of sweep efficiency and individual well productivity was also made.

As a result of these studies four additional wells were abandoned without appreciable loss of withdrawal capacity. Two more wells were converted to injection service by installing new 5000 psi wellheads and protective strings of 3½-in. J-55, 9.3-lb upset tubing with packers set in the 7½-in. casing 5 ft above the liner hangers. All remaining wells are presently being protected by 5½-in., 17-lb J-55 speedtite casing set on hook wall packers set in the 7½-in. casing 5 ft above the liner hangers. In all cases, the annulus between the protective strings and the 7½-in. casings has been filled with inhibited oil or salt water.

With the buildup and spread of pressure throughout the field it is no longer necessary to have pumps in the wells so all pump jacks and Kobe units have been removed.

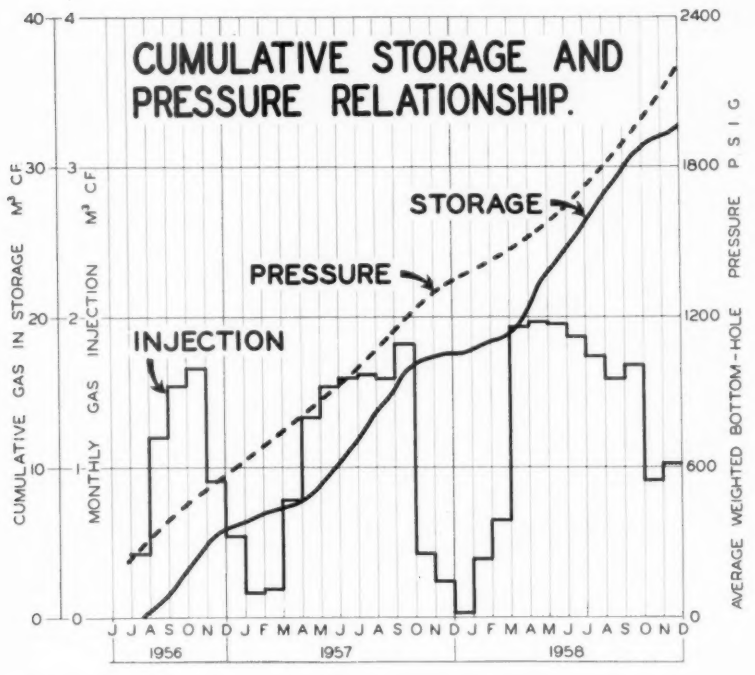
On April 5, 1958 the first well to be drilled from the drill site area was completed. This, like subsequent wells we expect to drill in the future from the drill site, was a directional well. The well has a drill depth of 8601 ft with a maximum deviation from vertical of 30 deg. which places the bottom 2854 ft southwest of the wellhead. Completion was made in the 8^{-2} and 8^{-3} subzones so that a better evaluation of these subzones can be made. At a later date we propose to gun perforate the well into the 8^{-1} zone so as to have the well open to the full section. With the completion of this new well and the other field work we now have 21 withdrawal wells and 9 injection wells.

Between Aug. 15, 1956 and July 27, 1958, 26 billion cu ft of gas was injected into the 8th zone as cushion gas. During the cushion gas injection phase two 24-hr withdrawal tests were made, to obtain additional data on withdrawal characteristics of the wells. During this period of time the average formation pressure was increased from 300 psi to 1850 psi.

Injection of cushion gas was followed by the injection of working gas, and on Jan. 8, 1959 we had 6.66 billion cubic feet of working gas in place, the maximum up to this time. During the summer of 1959 we expect to bring the amount of working gas in the formation up to the maximum of 12.5 billion cu ft.

Formation pressures are presently averaging about 2200 psi and will average about 3300 psi when the reservoir is full.

So far the winter of 1958-59 has been a mild one and it has not been necessary to use the field to the extent we had estimated. However, the periods of withdrawal have indicated that the field will function at least as well as anticipated. During one withdrawal period a rate of 235 MMcf per day was



Cumulative storage and pressure relationship.

attained. This rate exceeded the design rate of 200 MMcf per day for the scrubber and dehydrator without creating any problems.

We have just completed setting a second 200 MMcf scrubber next to the original one, and have installed a high pressure regulator setup off the injection line to feed into the new scrubber. This installation provides additional withdrawal capacity by making possible withdrawal from the injection wells through the injection line up to the scrubber location. This relieves the overload condition that existed on the central portion of the withdrawal line in the field so that additional gas can be pulled from the periphery withdrawal wells.

• Operations

Since this project encompasses both the storage of gas and the removal of fluids our operations have been in the direction of satisfying both requirements. Wells chosen for injection were located in the central portion of the field as near to the crest of the structural high as possible, and the withdrawal wells were located down-structure from the injection wells. As the gas bubble increases in pressure and size the formation fluids are partially swept ahead and produced from the withdrawal wells.

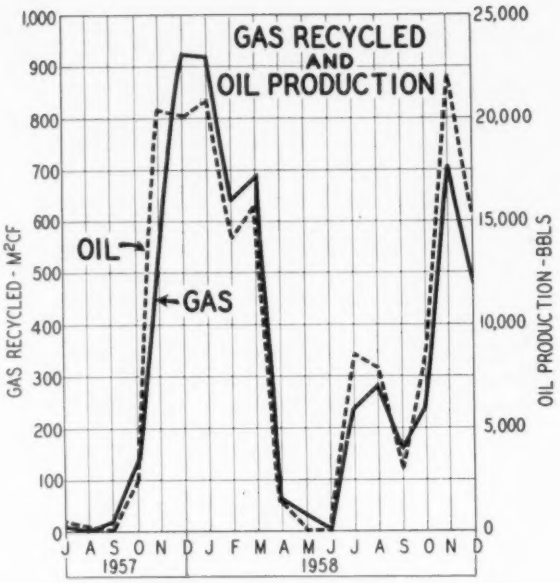
It has been our practice to carry on a recycling program whenever compressor capacity is available and the field is not being used for withdrawal. In this operation the withdrawal wells are used to produce the fluids at the lowest possible gas oil ratio. The fluids are trapped in the field scrubber and the gas is taken into the compressor intake line, recompressed and reinjected into the central portion of the field. For this service, Pacific is paid by the Eighth Zone Oil Pool a compression fee based upon a flat charge per barrel of oil produced. Presently, 1 bbl of oil and ⅓ bbl of water are produced for every 35 Mcf of gas cycled.

To date no estimate has been made of how long this recycling program will be economically feasible. The worth of the program is not entirely dependent upon the value of the oil produced for some value has to be placed upon the pore space made available to gas storage by the removal of fluids.

Withdrawal from the field is accomplished by using the withdrawal wells as the first source for rates up to 100 MMcf per day. Here again the idea is to sweep the field and remove fluids. For higher rates the injection wells are backflowed through the injection line up through the scrubber set up where the two streams join. By using the 21 withdrawal wells and 9 injection wells for withdrawal, we can sustain a rate of 250 MMcf per day.

The field has not gone through a full injection withdrawal cycle so that sufficient data are not available for a complete evaluation of the reservoir performance. Data so far accumulated appear to indicate that the volumes of gas we anticipated for storage were conservative. So far the performance of the field has been better than anticipated.

The out-of-state gas that we are injecting into the eighth zone has a very high helium content when compared to our local gas, the comparison being about 450 parts per million for out-of-state versus about 5 parts per million for the local gas. This feature gives us a built-in tracer so that it is possible to follow the movement of the gas by a regular bi-weekly sampling program. It also gives us a method of checking for leakage that might occur from the eighth zone into other zones.



Gas recycled and oil production.

• Conclusion

So far we have put three underground storage projects into operation. Basically, they are all the same but each had and will have its own individual problems. Montebello, due to its location within a metropolitan area, had an acute public relations problem and will continue to have as new homes continue to encroach upon the wells. Again, due to location it will have a higher field operating cost than our others but for the same reason it will also have a much lower transmission cost. The differences from field to field are many and the means of solution are varied.

As we develop more storage projects to better serve our growing number of customers our past experience will be a great guide but it will not provide the full answer.

The problem ahead is to build facilities, including underground gas storage, to provide gas to a population that is expected to double by 1980.

Of an anticipated 28 million California population by that time, more than 17 million will reside in the southern part of the state, which is largely supplied by the Pacific Lighting group of companies.

We are currently taking a look at eight potential underground gas storage fields. From past experience it would be difficult to say when or if any of these will be a reality and for this reason we are ever alert to possible storage fields. ■

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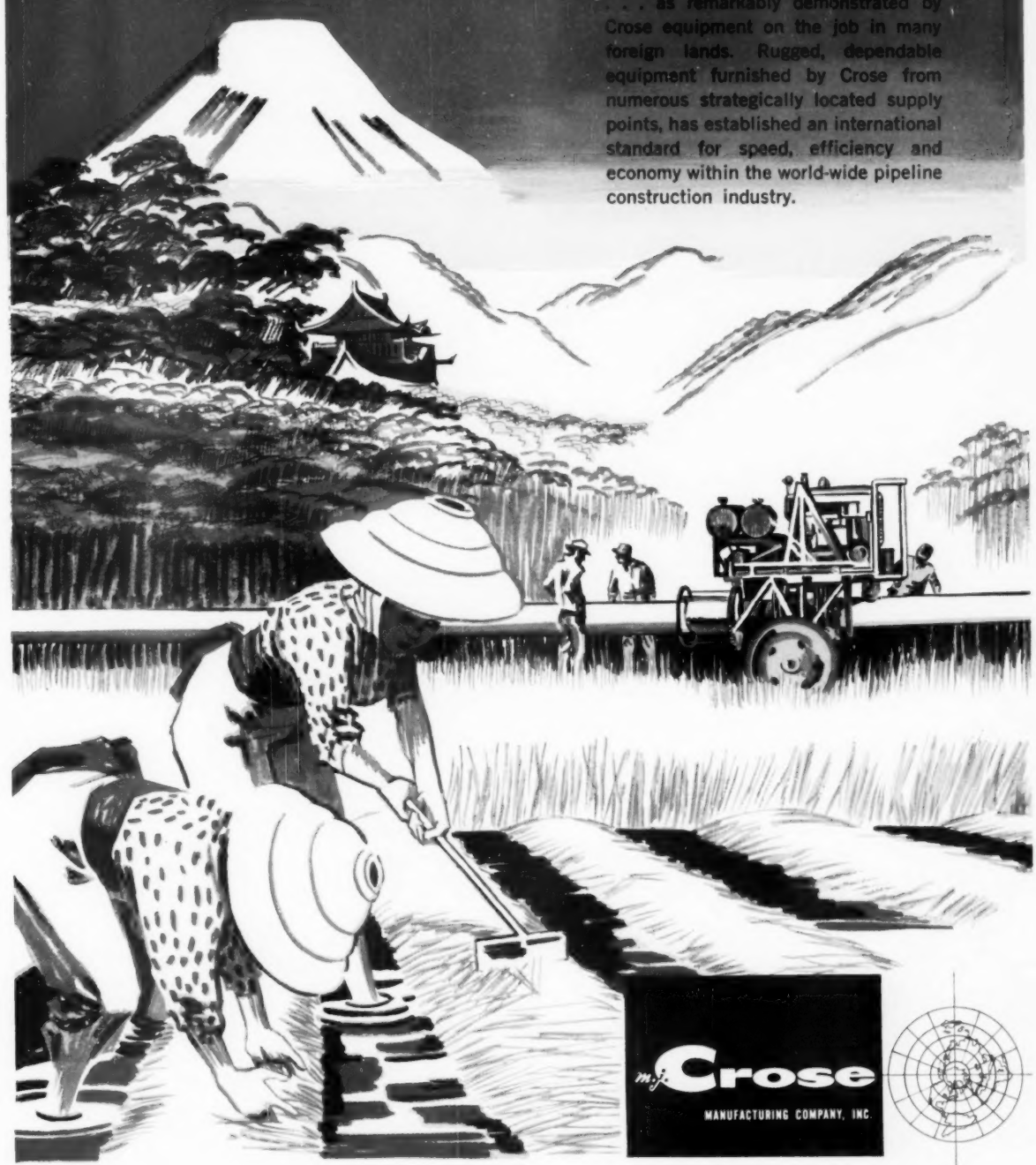
Pipeline construction can be a dramatic meeting of the Old and the New . . . as remarkably demonstrated by Crose equipment on the job in many foreign lands. Rugged, dependable equipment furnished by Crose from numerous strategically located supply points, has established an international standard for speed, efficiency and economy within the world-wide pipeline construction industry.



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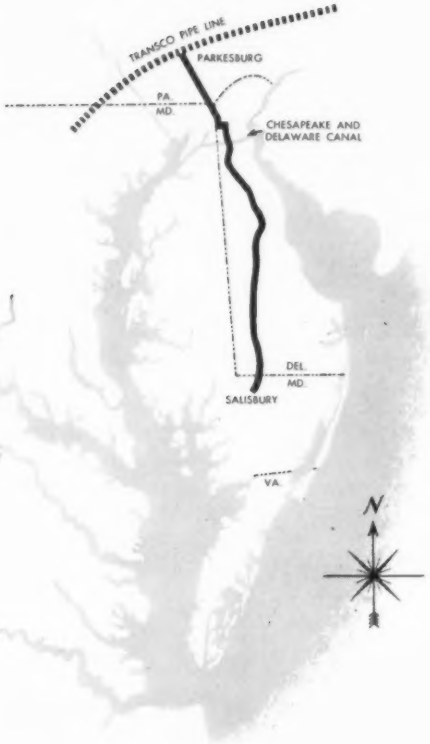
Eastern Shore's New Gas Line



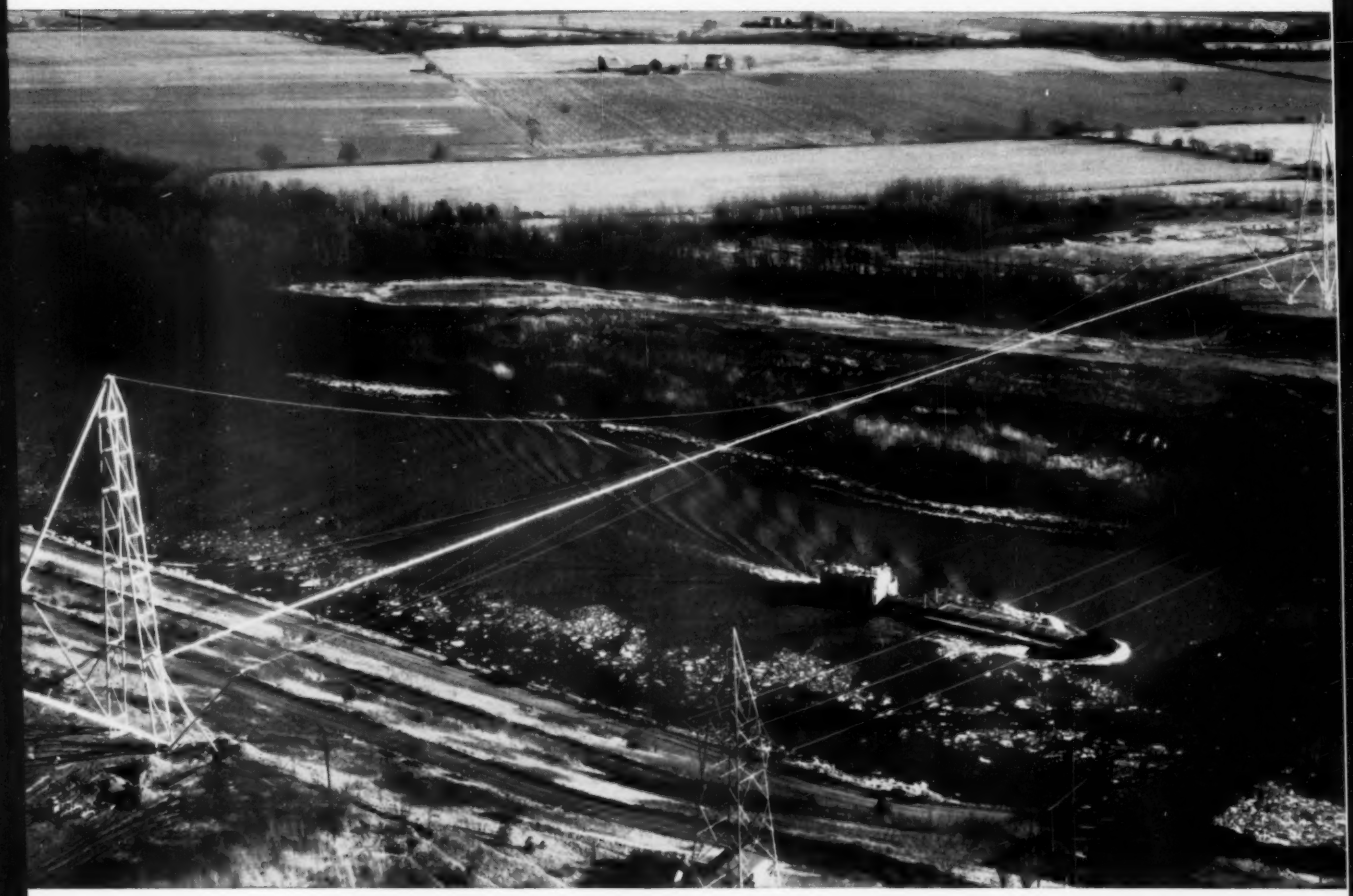
WITH the erection of this 1280 ft pipeline suspension bridge over the Chesapeake and Delaware Canal near Newark, Del., Eastern Shore Natural Gas Company's new 124-mile pipeline was completed and ready to serve waiting customers. The entire line had been laid and tested prior to the canal crossing, which linked-up the 8⅝-in. OD northern section with the smaller 6⅝-in. OD southern section.

Built with Bethlehem steel pipe—some 5,000 tons of it—the new line taps Transco's main line near Parkesburg, Pa., and runs as far south as Salisbury, Md. The line was installed by Buchanan Pipe Line Company. Over-all advisory services were supplied by Stone & Webster Service Corporation.

Transco's 36-in. OD looping line in southeastern Pennsylvania also required many tons of Bethlehem pipe. Looping along the entire length of the trunk greatly increased Transco's capacity.

Expert handling together with the uniform quality of Bethlehem pipe speeded installation of Eastern Shore's new pipeline. Noland Co., Inc., Washington, D. C., was the jobber.

Leaps 1280 ft Across Canal



Need Line Pipe? Bethlehem makes hydraulically expanded electric fusion-weld pipe from 18-in. through 42-in. OD, in 40-ft lengths; electric resistance-weld pipe from 5 in. (nom.) to 16 in. OD, in lengths to 60 ft; and continuous buttweld pipe ½ in. to 4 in. (nom.) in various lengths. All Bethlehem steel pipe meets the appropriate API specifications.

Contact the nearest Bethlehem Steel sales office for full information. Our engineers will be glad to assist you.

▲ QUARTER-MILE SPAN

Two 50-ton towers, plus strong Bethlehem wire rope and bridge strand, support the 12-in. steel pipe 140-ft above the Chesapeake & Delaware Canal. The structure was designed by Clear Span Engineering Co., Houston, and erected by Midwestern Contractors, Inc., Wheaton, Ill. The tubular steel towers were fabricated by Trinity Steel Company, Dallas, Tex.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

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Completely new from the ground up—backed by 10 years of rotary field experience—this all new Ingersoll-Rand Gyro-Flo 125 portable rotary compressor is based on results of extensive research, performance evaluation and customer suggestions.

Smaller and more compact than the original Gyro-Flo 125, this new unit incorporates many of the proven Gyro-Flo design features plus a host of new features that make it the best 125-cfm portable compressor available.

Some of its features are: larger engines at slower speed (1800-rpm)...60" track for greater stability on rough terrain...full-length tool boxes with more storage capacity...side covers that fold back safely away from operating eye-level...fuel and air tanks under lockable cover to guard against tampering...automatic drainage of oil from cylinders when unit is shut down...and provision for inspection of all rotor vanes. The new Gyro-Flo 125 is powered by 1800-rpm Continental engines—either gasoline or diesel. Ask your Ingersoll-Rand representative for complete details or send today for a copy of Form 2930.

DIMENSIONS AND WEIGHTS

2-WHEEL MOUNTING	GASOLINE	DIESEL
Weight (dry)	2442	2503
Weight (wet)	2647	2737
Length, incl. draw bar	10'1"	10'1"
Width	5'8¾"	5'8¾"
Height	5'1½"	5'1½"
Track	60"	60"
LESS RUNNING GEAR (INCL. SHIPPING SKID)		
Weight (dry)	2165	2226
Weight (wet)	2370	2450
Length	5'9¾"	5'9¾"
Width	2'8¼"	2'8¼"
Height	3'8¾"	3'9½"

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AN UNBEATABLE COMBINATION...GYRO-FLO COMPRESSORS AND I-R ROCK DRILLS

Communications and Automation

Edited by FRANK CHAPMAN

Klystron tube puts in 62,000 hours

IN 1951 a certain Klystron tube started its working career as the major element in a Panhandle Eastern Pipeline Co. microwave station at Houstonia, Mo. This was Reflex Klystron Number 65C (short for 65C 841281). Its job—relay 10 channels of information between the Boonville and Odessa stations in a 400-mile microwave system.

This hard working Klystron was in action continuously on the system's voice, telemetering and VHF radio control channels. After a year or two of 24-hour per day, 365-day a year service, one expects most conventional electron tubes to become tired and be retired from active life. However, Klystrons, being somewhat exceptional tubes, usually don't expect to be laid to rest until they have put in at least three or four years of continuous service. But our friend Klystron 65C carried on for more than 7 years—more than 62,000 hours of active, continuous service.

Finally, it was noticed that old faithful Klystron 65C was weakening. Its emission was falling off—

a very serious ailment for its kind. But it did not go unnoticed or unproclaimed. Klystron 65C has been embossed in gold and mounted on a mahogany pedestal to serve as an example for younger tubes.

Thus representatives of Motorola, manufacturer of the microwave system, and Panhandle Eastern Pipeline Co. met in Kansas City to cite Klystron 65C for its yeoman service. In the picture, then, you see (from l to r) J. A. Fowler, Panhandle's supervisor of communications; F. J. McElhatton, operations manager for Panhandle Eastern; and Homer Marrs, vice president of Motorola. That's old 65C on the trophy.

And the fabled Klystorn is still at work! Its new job—paperweight on Fowler's desk.

NCUR meets this month

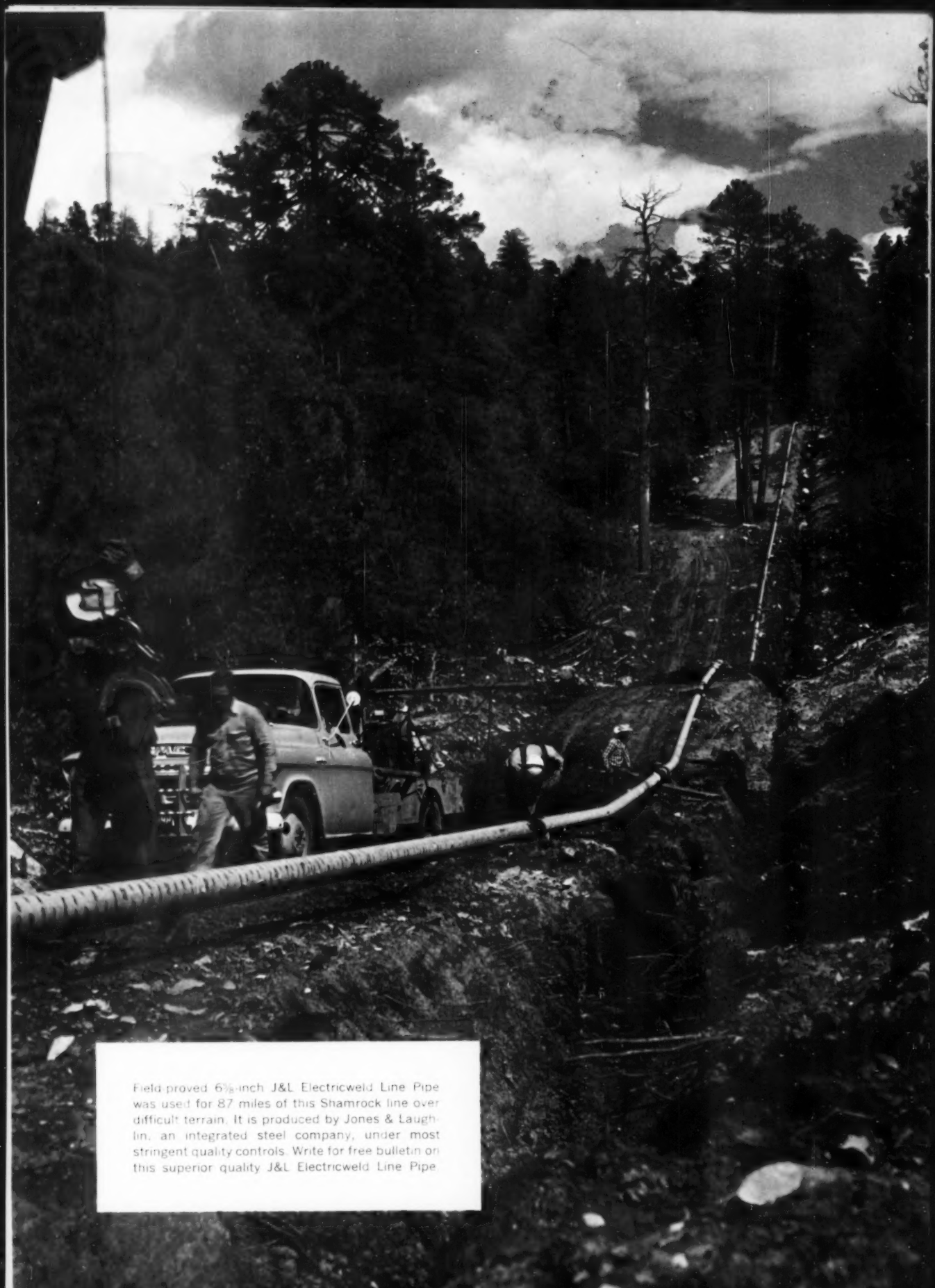
The annual meeting of National Committee for Utilities Radio (NCUR) will be held June 15-17 at the Continental Denver hotel. On March 18 and 19, NCUR's Executive Council met in Washington, D. C. There, they reviewed the testimony to be presented by NCUR witnesses to the FCC in connection with the commission's review of allocations in the 25 mc to 890 mc part of the spectrum (Docket 11997).

The testimony will include estimates of the radio channel requirements of the utilities for the next 10 years—based on a survey of present and proposed use by utilities in all parts of the U. S. The fact will be emphasized that previous estimates of utilities' requirements have been proven conservative by actual experience.

NCUR is interested in obtaining FCC approval for the use of tones or mobile frequencies on a secondary basis to perform certain functions. It will address a letter to the commission's staff, listing various functions which might be performed for power utilities by such tone signals instead of by voice instructions carried by radio. Such use of tones could decrease the air time required to accomplish the desired functions. Such a list of functions which the utilities desire to perform by tone signals on mobile radio frequencies was requested by the staff for its use in deciding if a rule change would be proposed to permit such use.

Receiving tube manual

A newly revised edition of the "RCA Receiving Tube Manual" has been announced by the RCA Electron Tube Division. More than 3.5 million copies, in eight editions, of the manual have been sold since 1933. Copies of the new Manual (RC-19) can be obtained from RCA tube distributors or from Commercial Engineering, RCA Electron Tube Division, Harrison, N. J. The price is 75 cents.

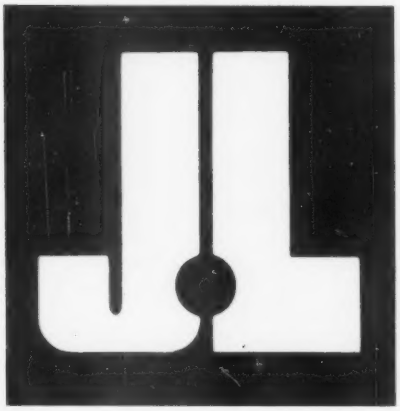


Field proved 6⅝-inch J&L Electricweld Line Pipe was used for 87 miles of this Shamrock line over difficult terrain. It is produced by Jones & Laughlin, an integrated steel company, under most stringent quality controls. Write for free bulletin on this superior quality J&L Electricweld Line Pipe.

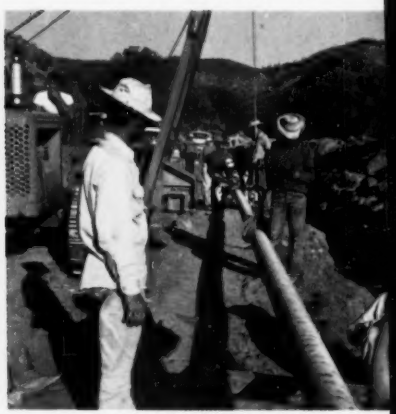
New six inch products line will be operated by Shamrock for its affiliate, West Emerald Pipe Line Corporation.

Welders on this Shamrock line reported that J&L Electricweld Line Pipe was uniformly round, easy to weld.

Pipe is produced under strict compliance with appropriate A.P.I. and A.S.T.M. specifications.



Contractors for the rugged section from Palma, N.M., to Albuquerque were Groninger & King, Pampa, Texas.



Pipe is A.P.I. Standard 5 LX, Grade X 42, 12.89 pounds per foot, with a .188 inch wall thickness.

"Superior weldability of J&L Electricweld Line Pipe was proved on this mountainous operation"

. . . reports pipe line contractor

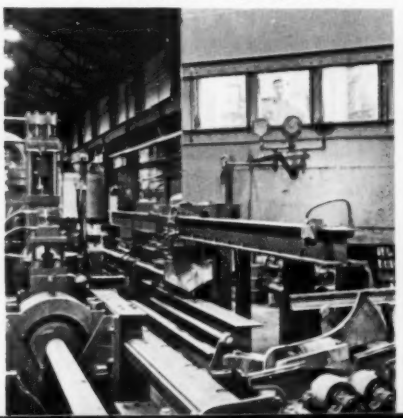
Steep, mountainous terrain presented a real challenge to pipeliners working on this Shamrock Oil and Gas Corporation line from Amarillo to Albuquerque. Eighty-seven miles of $6^{5}/_{8}$-inch J&L Electricweld Line Pipe were used in the rugged section from Palma, N.M., to Albuquerque. Performance proved conclusively that J&L Electricweld Line Pipe bends readily to contour, is easy to weld and is uniformly round. It is readily available from $6^{5}/_{8}$ inches through $12^{3}/_{4}$ inches.

Jones & Laughlin Steel Corporation

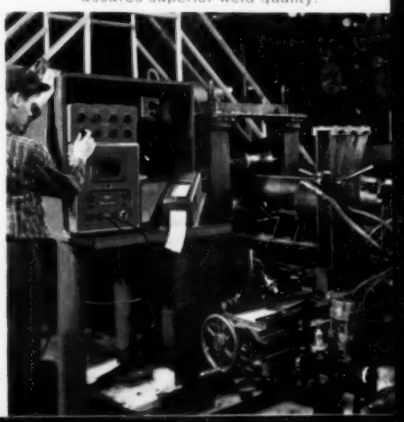
PITTSBURGH, PENNSYLVANIA

J&L Electricweld Line Pipe is produced on one of the most modern mills in the world.

Hydrostatic test is one of a series of inspections and tests given every length of pipe.



This modern J&L ultra sonic tester assures superior weld quality.



Many new techniques and methods of telemetering are available today as a result of rapid advances in the science of data processing and transmission. Today, more than ever, selection of the telemetering system best suited to a particular application requires careful study of many alternatives to insure maximum effectiveness at minimum cost.

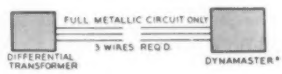
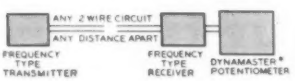
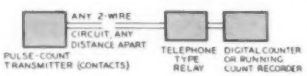
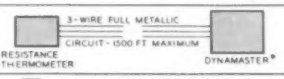
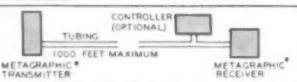
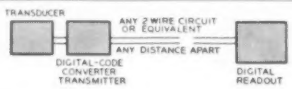
The Bristol Company offers *all* the major types of industrial telemetering systems, as outlined in the table herewith. For some applications, of course, certain features of one system may be combined with another, allowing great flexibility in tailoring a system to your application.

The complete line of Bristol industrial telemetering instruments embodies over 45 years' experience in this field. Bristol engineers are always ready to recommend telemetering instruments to solve your particular problems or to work closely with your own engineers in the design of a complete telemetering system to your requirements.

For further information, write: The Bristol Company, 119 Bristol Road, Waterbury 20, Connecticut. 9.6

TIPS ON INDUSTRIAL TELEMETERING

for pipe lines, utilities, and process industries

TYPE	OFFERED BY BRISTOL	SIMPLIFIED BLOCK DIAGRAM	ADVANTAGES AND LIMITATIONS	MAJOR USES
IMPULSE DURATION	Metameter*		Simple electro-mechanical device. Will transmit over wire circuit, carrier or microwave links. Offered in 60, 15, 5 or 2 second impulse cycles.	For analog transmission of all measurands.
VOLTAGE	Thermoverters* & Dynamaster.* D-C Transmission		Instantaneous transmission. Limited to full metallic circuits of 2000 ohms (2 wires) free of parisitic currents.	For analog transmission of electrical quantities.
	Differential Transformer Transmitter & Dynamaster. A-C Transmission		Instantaneous transmission. Limited to full metallic circuits. (3 wire.) Can operate into electronic control directly.	For analog transmission of mechanical measurands.
FREQUENCY	Frequency Type Transmitter & Receiver with or without Audio Tone. (RFL) Model with Dynamaster End Device		Practically continuous. For millivolt inputs or measurand to millivolt pick-ups. Will operate over wire circuits, carrier or microwave radio links.	Primarily for transmission of electrical measurands but may be adapted to non-electrical quantities where high speed transmission desired.
PULSE COUNT	Transmitter – Contact Making Device. Receiver – Relay Operated Magnetic Counter or Running Count Recorder		Simple. Will transmit over wire circuit, carrier or microwave link.	Primarily for total flow transmission. Not used for instantaneous flow.
POSITION	Dynamaster Resistance Thermometer System		Instantaneous Transmission. Requires 3 wire metallic circuit not exceeding 1500 feet.	Temperature measurements.
PNEUMATIC	Metagraphic System. Metavane* System		Limited to 1000 feet of ⅛" tubing. Can operate into pneumatic control directly.	For non-electrical quantities where pneumatic transmission desired.
DIGITAL	Bristol Servo Transducer with Westinghouse, G. E., or Union Switch & Signal Pulse Code System		For transmission over wire circuits, carrier or microwave.	For digital transmission of all measurands, especially where pulse code supervisory control is available. Direct print-out of readings.

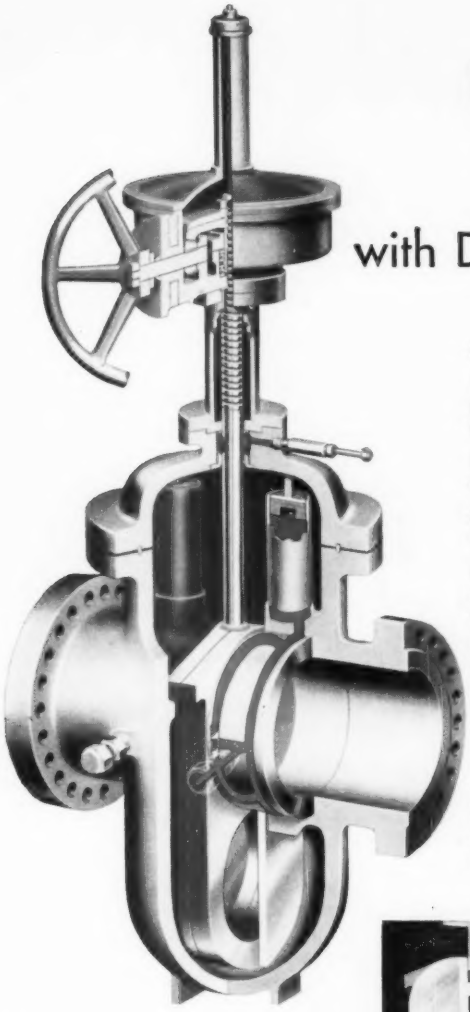
T.M. Reg. U.S. Pat. Off. **Write for technical information**

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

NEW ADVANTAGES "GO ON THE LINE"

with DARLING-McEVOY Conduit Valves



Above: *Cutaway showing heavy, self-aligning gate and parallel seat assembly, with one of the two sealing systems indicated.*

Compare these features with *any* other pipe line gate valve:

1. EVERY CLOSURE LEAK-PROOF. No forcing. Positive automatic self-sealing under line pressure between seats and gate and between seats and body by means of sealing compound.

2. NON-DIRECTIONAL. Flow may be in either direction. Sealant cylinders operate independently.

3. TWIN SEALANT RESERVOIRS. One for each port. Sealant feeds automatically to downstream side only.

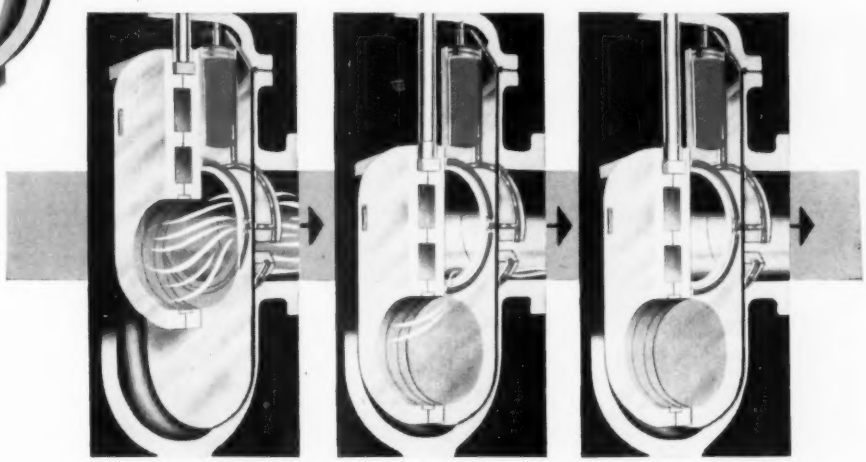
4. NEGLIGIBLE SERVICING. Leak-proof closure requires very little sealant. Reservoir capacity ample for 50 to 80 operations dependent on differential pressures.

5. SMOOTH, FULL FLOW. No impediments. No turbulence. No pockets to collect sediment.

6. EXCEPTIONAL PERFORMANCE AND LIFE. Self-aligning gates. No wedging. Non-distorting seats, protected when valve is open or closed.

Darling-McEvoy conduit valves, made in 4" and larger sizes, are fully field proved and are now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

Right: *Diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED. *Pressures again in balance. Tightness established. No additional sealant used until again needed.*

DARLING VALVES

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 26, Pa.

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GAS • PIPELINE NEWS

American Natural seeks 201 MMcf gas supply

On file with the FPC are two plans to increase American Natural Gas System's supply by 201 MMcf daily from Canada and Louisiana.

Applications were filed by Michigan Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co., both American Natural subsidiaries.

In addition to building new facilities, Michigan Wisconsin wants to buy 158 MMcf of gas a day from Midwestern Gas Transmission Co. (see GAS, May, p. 144).

American Louisiana wants to expand its pipeline capacity by 43 MMcf daily with more gas from southern Louisiana.

Michigan points out that Trans-Canada Pipe Lines Ltd. has contracted to sell 204 MMcf daily to Midwestern near Emerson, Manitoba. Midwestern's plans call for 500 miles of line to Marshfield, Wis., where deliveries would be made to Michigan Wisconsin.

Michigan will extend its existing pipeline from near Appleton, Wis., to Marshfield. Construction includes 311 miles of line in Wisconsin, a new 5280-hp compressor station at Marshfield, 23 measuring stations and 31 miles of line in Illinois, 17 miles in Indiana and 18 in Michigan. Cost is an estimated $24.7 million.

Service to eight new utilities is included in the plan. Twenty-seven communities in the Wisconsin River Valley area, Marinette, Wis., and Menominee, Mich., will get gas service. Also covered is gas for Michigan Consolidated Gas Co., an American Natural affiliate, for service to the Upper Peninsula of Michigan.

These new markets will require about 39 MMcf daily, leaving 119 MMcf to be shared by Michigan Wisconsin's existing customers

American Louisiana's plan includes building two new compressor stations at a cost of $6 million. The 8000- and 10,000-hp stations will increase deliveries by 43 MMcf a day.

Installation of the new stations was previously proposed but had to be suspended when a gas producer cancelled contracts upon which American Louisiana relied for its gas.

The company has since acquired sufficient gas for the expansion as a result of further development and dedication of additional reserves from other Louisiana suppliers.

Crawler crane, with clamshell attachment, lifts bucketsful of rain-soaked clay and loam from water-filled trench. Pipe is about to be lowered into the ditch along the first 20 miles of North Carolina Natural Gas Corp.'s system.

North Carolina Natural Gas Corp.'s 630-mile transmission line runs from the Piedmont area of the state to the coastal plain. The line ties in with the Transco system at Mooresville. Five major cities—Wilmington, Fayetteville, New Bern, Washington and Kinston, are the franchised properties of Tide Water Natural Gas Co. Contractor for the line is C. N. Flagg & Co. Inc., Charlotte, N. C.

Coastal files to increase Florida gas deliveries

Coastal Transmission Corp. wants to increase deliveries of gas to Houston Texas Gas & Oil Corp. to 335 MMcf per day. The company asked the FPC for an okay on its $6.2 million project involving both compressor and lateral pipeline facilities.

The additional gas would be delivered to Houston Texas Gas near Baton Rouge. From there it will move on into Florida.

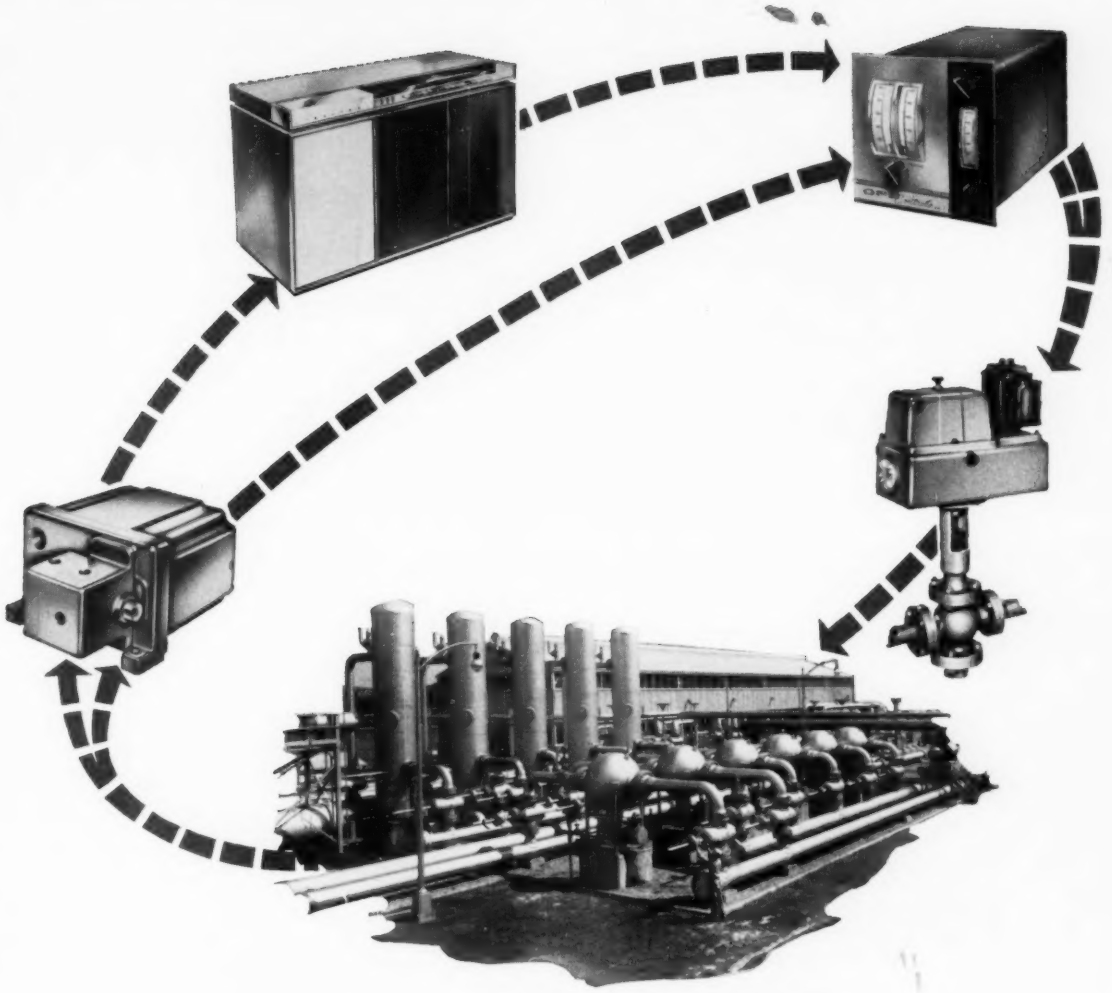
The new application was filed before Coastal's originally authorized system was completed. Operations are slated to start early in June.

Coastal's newest application is the first of a series of expansion programs it expects to launch during the next few years in order to order to adequately serve the growing demand for gas in Florida. When the expansion program is approved, Coastal's gas will come from about 60 different gas fields along the gas producing area of the Texas and Louisiana Gulf coast.

Gas well pressure bulletin issued

The Texas Petroleum Research Committee has published TPRC Bulletin 72, "The Determination of the Flowing and Static Bottom-Hole Pressures of Natural Gas Wells."

The book presents a method and manual of procedure developed by the committee to help in the determination of the performance and potential of gas wells. An important item in such determinations is the calculation of static and bottom-hole pressure from sur-



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For 1959, this is the big news in automatic controls for the petroleum industry—closed-loop process control systems incorporating digital computers!

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face observations. The TPRC method not only increases the accuracy and ease of making such computations. It also greatly increases the reliability of the computations with the result that they can be readily checked, errors found, and discrepancies ascertained.

Bulletin 72, authored by Paul B. Crawford and George Fancher, contains 142 graphs, figures and charts. Their uses are explained briefly and clearly by examples completely worked out.

The Texas Railroad Commission authorizes the use of the TPRC method in the adjustment of the absolute open-flow for determination of the potential of gas wells required by state-wide Rule 24 and the submission of Form GWT-4. The bulletin also is authorized for use in conjunction with the manual of the standard, "Back Pressure Test for Natural Gas Wells for the State of Texas."

The bulletin, priced at $5, is available from the Texas Petroleum Research Committee, 201 Petroleum Engineering Bldg., University of Texas, Austin 12.

Canadian gas export vital

Export of Canadian natural gas to the U. S. is vitally important to the success of Trans-Canada Pipe Lines' overall operations, President James W. Kerr told shareholders recently.

Trans-Canada has a contract with Midwestern Gas Transmission Co. to sell Midwestern 204 MMcf of gas daily at Emerson, Man. The export project would result in much healthier earnings for Trans-Canada, and particularly would hasten the time when earnings would permit acquisition of the section of line owned by Northern Ontario Pipe Line Crown Corp.

NI-Gas gets major supply from Northern Natural

Federal Power Commission agreed with its presiding examiner that Northern Natural Gas Co. can increase its capacity by 1000 MMcf per day to serve one new customer in Illinois and increase deliveries to 23 existing customers (see GAS Highlights, May, p. 8).

The new customer, Northern Illinois Gas Co., will build a $12.5 million, 140-mile line to pick up the 50 MMcf near East Dubuque, Ill. The allocation will permit the Aurora, Ill., distributor to add about 41,500 heating customers to its lists.

NI-Gas president Marvin Chandler said his company still must get Illinois Commerce Commission permission to build the pipeline. But, he said, the ICC chairman has assured him that the commission would act on the application promptly. Large diameter pipe has been ordered and work is expected to start early this summer with completion by next winter.

Chandler said the new gas supply clears up the househeat waiting list for individual new homes through Nov. 7, 1957, and for existing homes through Feb. 27, 1958.

Northern Natural will spend $8.2 million for the facilities to move the gas to Northern Illinois (Docket G-14697). The other project Docket G-14779, covers construction of facilities to provide 49.8 MMcf daily to the 23 existing customers at a cost of $7.7 million.

Commission okays budget-type plans

FPC has approved budget-type plans of several pipeline companies. These include:

Lone Star Gas Co., Dallas (G-16851), to spend up to $1 million on lateral lines and related field facilities. These will enable it to acquire gas from producers in the general area of its system in Texas and Oklahoma.

Texas Eastern Transmission Corp. is limited to $4 million in Docket G-17042. Its new facilities will enable it to take gas purchased from producers in Texas, Louisiana, Mississippi, and Illinois.

Columbia Gulf Transmission Co. was authorized (Docket G-17550) to build new facilities not in excess of $2.5 million. When completed, the facilities will enable Columbia Gulf to connect to its system new supplies of gas purchased by its affiliate, United Fuel Gas Co.

El Paso Natural also has approval of its budget-type plan covered in Docket G-17256. It is limited to $5 million. Included are field lateral lines ranging from 4½ to 20 in., compressor facilities ranging from 300 to 1600 hp, purification and dehydration equipment, and gasoline plant facilities.

Gas finds pace gas use

Natural gas is being found in the U. S. about as fast as use of the fuel is increasing, an FPC official told Congress.

Speaking was Carl T. Kallina, chief of the commission's bureau of rates and gas certificates. He testified before a closed session of a House appropriations sub-committee that new gas fields are being found and that the nation is not running out of gas.

When asked if it would be to this country's best interest to "import gas, import fuel" in order to protect our domestic reserves, Kallina replied: "If you confine the question to importing gas, I will go along . . ."

Large gas compressors go to helium recovery plant

Six of Cooper-Bessemer's large type GMW gas engine compressors are going to be used for the newest helium recovery plant at Keyes, Okla. The Department of Interior's Bureau of Mines placed the $1.5 million order.

When completed, the Keyes recovery operation will be the fifth plant of its kind for extracting helium from natural gas. Similar plants are already located at Exell and Amarillo, Texas; Otis, Kan.; and Shiprock, N. M.

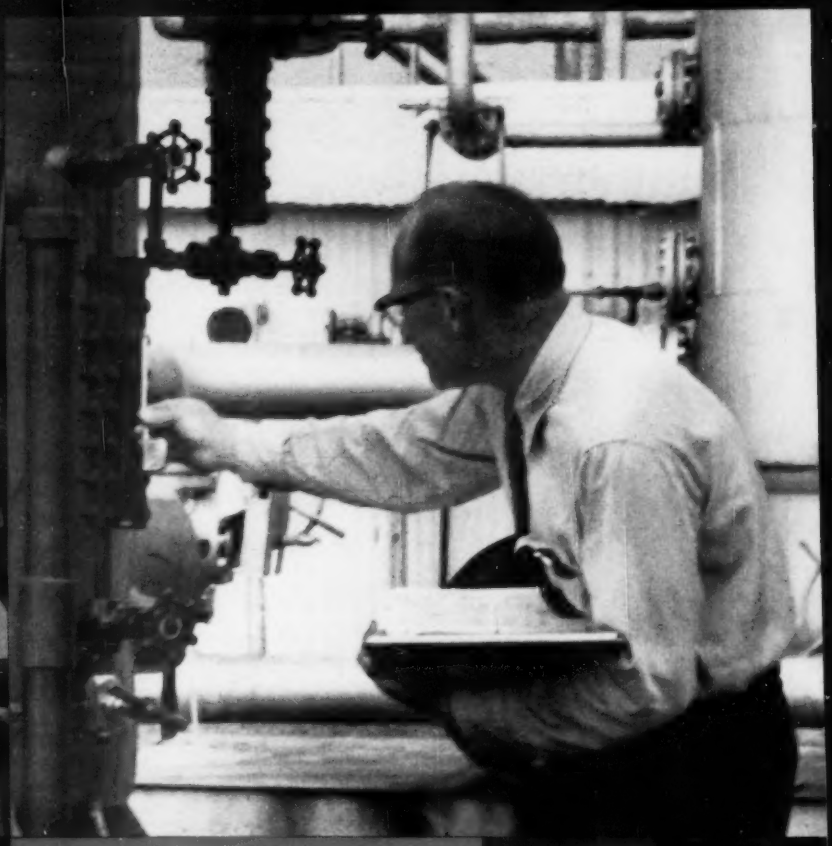
Cooper-Bessemer's compressors will compress natural gas containing the raw helium to extremely high pressures to separate the helium from the remaining natural gas. The gas will then be pumped into cross country transmission lines for delivery to the Midwest and East.

Northern's new Midwest plan gets FPC hearing

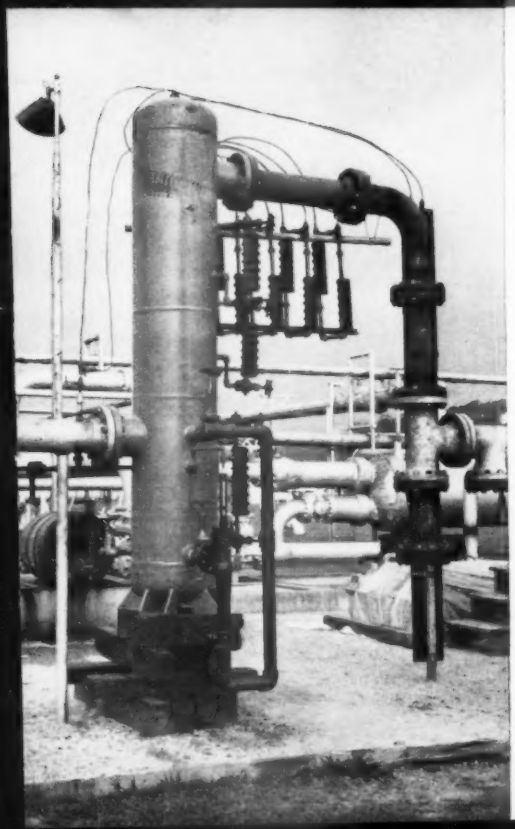
Hearings are under way on nine applications by five companies proposing to spend more than $108 million to bring more gas into six midwestern states.

Involved are four applications by Northern Natural Gas Co. (Dockets G-17485 and 17486) proposing expenditures of more than $98 million to supply gas service for the first time to 326 communities in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin, and Illinois (sse March GAS, p. 144).

Other companies involved are Iron Ranges Natural Gas Co., St. Paul, which will spend $7.6 million on facilities in Minnesota to receive gas from Northern and serve 28 communities and several industrial customers; El Paso (Texas) Natural Gas Co., Permian Basin Pipeline Co. (Omaha), and Phillips Petroleum Co., Bartlesville, Okla.



PROJECT NFX-12



. . . A.G.A.'s giant step toward cleaner gas

You're looking at the test site of a vital research project sponsored by the American Gas Association. Six competitive gas cleaners—including Blaw-Knox—were studied for cleaning and oil loss efficiencies.

It was an important step . . . the first time gas cleaners have been so scientifically and impartially tested. The project set the stage for continuing research to improve gas cleaner performance.

Following the test, Blaw-Knox was the first to build a new pace-setting "Multi-Phase" cleaner. Now proven by our extensive supplemental testing, the Blaw-Knox "Multi-Phase" cleaner surpasses previous performance for low oil loss while cleaning gas of even sub-micron size foreign particles.

Blaw-Knox is proud to have been part of the A.G.A. project. From it comes the best gas equipment in Blaw-Knox's history to assure you of cleaner gas at lower cost. Let Blaw-Knox give you more details. Write . . .

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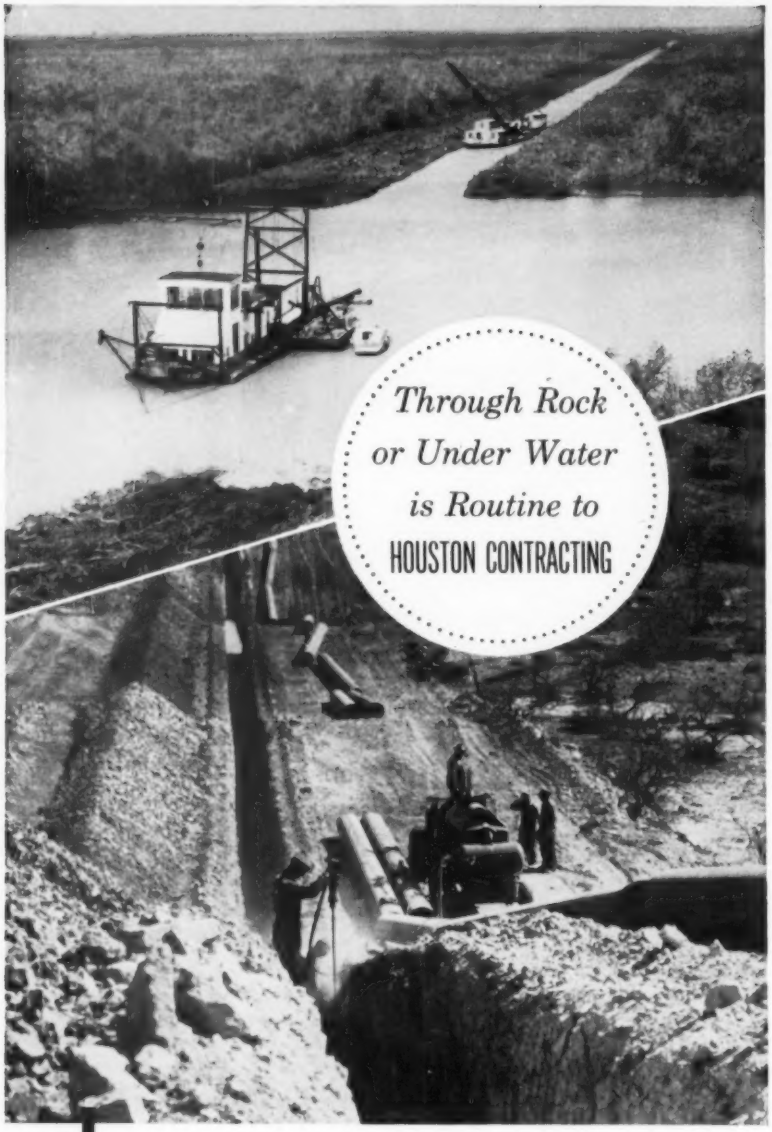

Well known for their unexcelled experience in the marshlands, Houston Contracting is equally adept at handling the problems encountered in all types of terrain. Swamp gumbo, rock, sand, and frozen ground, all have given way to Houston. If it's pipelining, Houston Contracting can do it efficiently and on schedule.

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103

Applications of the latter three companies concern Northern's gas supply. El Paso proposes to spend $2.5 million on new facilities, but neither Permian nor Phillips plan construction.

One of Northern's filings (G-17485) covers a $25.7 million extension of its system from Minneapolis to the Duluth-Superior area and to serve 39 towns in Minnesota and Wisconsin. Included are 171 miles of mainline extensions, 66 miles of mainline loop additions, 6000 compressor hp, and 139 miles of branch lines.

Docket G-17486 covers 46 miles of mainline extensions, 191 miles of loop additions, 45,400 in compressor hp, and 1767 miles of branch lines. This $76.6 million job would serve 287 towns in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin, and Illinois.

Permian Basin now supplies 425 MMcf daily to Northern through a transportation-exchange agreement involving El Paso. El Paso accepts up to 425 MMcf from Permian in Yoakum county, Texas, and delivers a like amount to Northern in Moore county, Texas. Under the new applications, El Paso plans to deliver 25 MMcf of this gas to Northern in Beaver county, Okla.

Permian plans to increase its daily sales to Northern by 50 MMcf, making the total 475 MMcf per day. In turn, El Paso's deliveries would increase its deliveries to Northern in Moore county by 50 MMcf. This gas would come from Phillips.

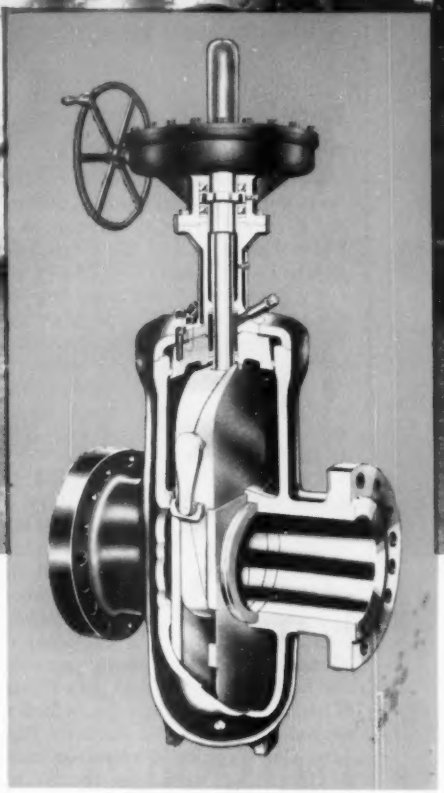
Phillips wants to stop the 50 MMcf per day sale it now makes to Northern. If okayed, El Paso would acquire the facilities Northern now uses to receive the gas from Phillips. The contract between Phillips and Northern ends on Jan. 1, 1960, at which time El Paso is contractually entitled to receive the gas.

American Louisiana seeks demand-commodity rate

With its second filing for a demand-commodity form of rate, American Louisiana Pipe Line Co. said that conditions prescribed earlier by the FPC have been met.

The conditions were that the company should have two years of operating experience or could show a test period based on at least 12 months of actual experience which would be indicative of future operations.

American Louisiana started op-



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W-K-M Pipeline Valves open **free** and close **easy** against any pressure within their rating. An exclusive centralizing mechanism—found only in W-K-M Leverlock Valves—positively holds the gate and segment assembly in a retracted position so that it will move freely between the seats when the valve is being opened or closed.

When the gate and segment reach the fully open or fully closed position—and only then—the centralizing mechanism releases to permit the gate and segment to expand and seat tightly against the upstream and downstream seats.

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Order 2-inch through 12-inch sizes from your supply store. Larger sizes to 34-inch available on special order from factory. Sizes 6-inch and larger are Leverlock Valves. ASA 300 pounds to ASA 1500 pounds.

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The W-K-M® Through-Conduit Gate Valve is your valve

W-K-M's creative engineering designed this valve to solve *your* pipeline valve problems. It has been produced to meet your specifications for strength, long life and economy. Before it reaches you, it will have undergone rigorous and thorough testing.

That's why field men recommend the W-K-M Through-Conduit Gate Valve, why engineers specify its use. Its reputation inspires confidence—its dependability has been proved in service throughout the world.

It's *your* valve; specify and use it. *Write for Catalog 300:*
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Without removing the valve body from the line, the set pressure and re-set pressure of a Garrett Relief Valve may be checked in a few minutes time. Using the small, light weight Garrett Test Fixture, pressure from bottled nitrogen or other source, and regular hand tools, pressures may be checked or changed by field personnel, without special training.

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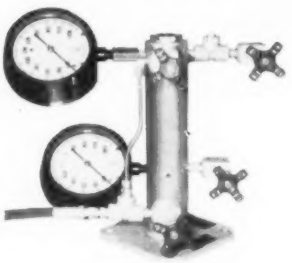

The Garrett Test Fixture is simple to use, light and easy to carry, and completely accurate in operation.

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erations in August 1956. In July of that year, the commission rejected the initial filing of a two-part rate and substituted the cost rate form. Again in 1957 the company filed for the demand-commodity rate. It was rejected. In its order, the FPC said that the company's brief period of actual operations had not yielded sufficient experience to justify the change.

The present filing shows that—based on the calendar year 1958—the two-part rate would result in a $900,000 increase out of total revenues of about $45 million.

Examiner hits Trunkline allocation and rates

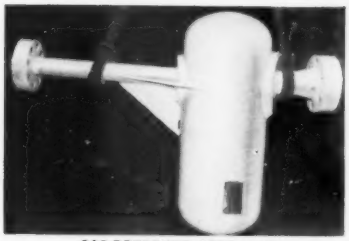
Presiding Examiner Francis Hall turned down Trunkline Gas Co.'s $81.5 million plan to supply up to 135 MMcf daily to Consumers Power Co. (Dockets G-15394 et al).

By rendering service only to Consumers through this program, Trunkline is by indirection trying to assume functions of allocation "the exercise of which is entrusted solely by Congress to the Commission," the examiner said (see GAS Highlights, May, p. 8).

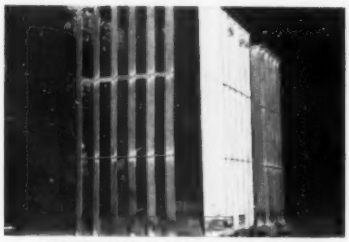
Facilities proposed would increase design delivery capacity of Trunkline's system from 375 MMcf daily to 510 MMcf. This entire capacity would be used to sell the 135 MMcf to a single customer, Consumers. (The Jackson, Mich., company is not now a customer of Trunkline.) Consumers receives the bulk of its gas from its affiliate, Michigan Gas Storage Co., which is served by Panhandle Eastern Pipe Line Co. Trunkline now sells most of its gas to Panhandle, its parent. The proceedings also include a filing by Michigan Gas to use existing facilities to transport gas for Consumers.

Trunkline would pay 20 cents per Mcf for gas it intends to buy in Texas and 22 cents for Louisiana gas. Consumers would buy the gas at an average of 35.75 cents per Mcf. At the moment, Trunkline sells gas to Panhandle for 27 cents per Mcf.

Presiding Examiner Hall noted that Consumers has need for the gas and that its $31 million project already has been approved by the Michigan PSC. He wanted to know, however, why Panhandle didn't ask Trunkline to seek authority to expand its system beyond what had been proposed in order to meet not only Consumers' needs but those of others as well.



GAS PRESSURE, 1500 p.s.i.



SPECIAL ALLOY STEEL DEFLECTORS

TOWER, 8'6" dia. x 154' in length

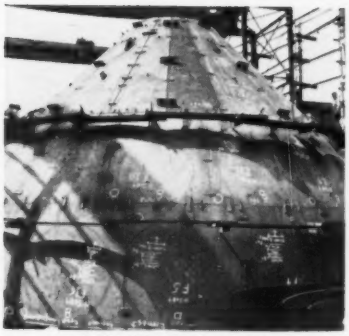
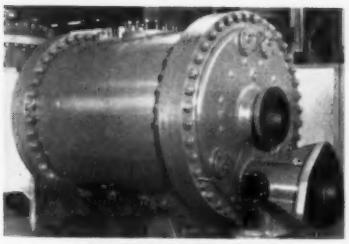
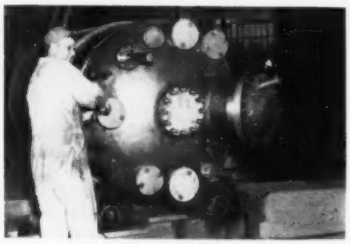


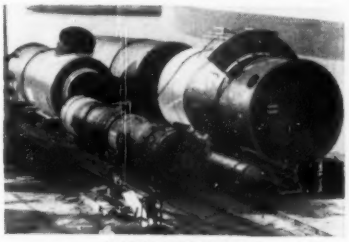
PLATE WORK, 55' dia. cone



SPECIAL CHEMICAL VESSEL

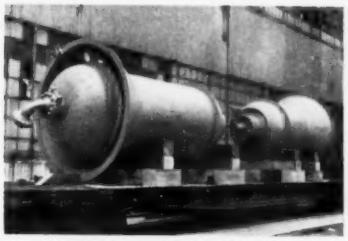


STAINLESS AUTOCLAVE

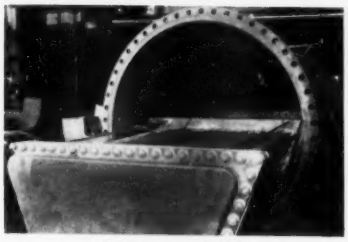


WATER SHIPMENT

GALVANIZING POT



SPECIAL STAINLESS VESSELS



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Model M24 on 3" pipe with guard removed. Inset shows guard in position.

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Examiner Hall said that Trunkline and Panhandle had delayed adequate service to Consumers until the company felt it had no alternative but to agree to accept "their brand of rate making and the high field prices of the producer-applicants . . ."

Hall also objected to the new rate schedule proposed for the gas sold to Consumers. He held that as a matter of sound regulatory principle—and in the event the applications were approved—the cost of the proposed expansion should be allocated on a system-wide basis or rolled-in cost basis rather than only to Consumers, which would receive the added capacity.

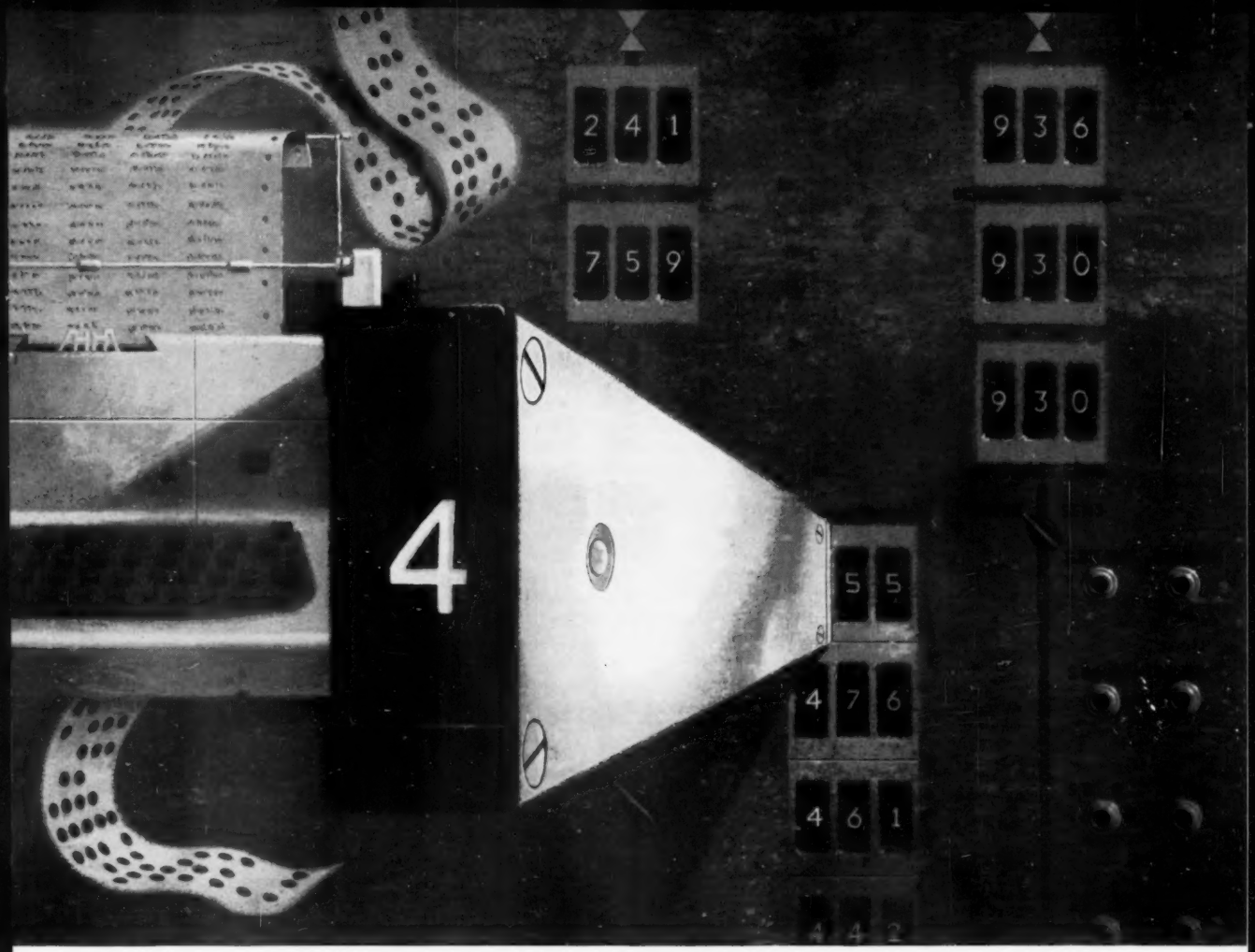
He said, however, that every purchaser in a similar position should be equally eligible and under the law must be permitted to purchase gas under any authorized schedule. Also, each must be given an equal opportunity to be heard in any commission hearing on an allocation of gas to be made available through added Trunkline facilities.

Examiner Hall cited the "unhealthy trend" of higher field prices and their effect upon other segments of the industry. He declared that to impose these rates upon Consumers, "rates which have not been shown to be just and reasonable," would encourage all gas producers and pipelines to believe that they have the right without restriction to pick and choose the customers who are the highest bidders, rather than to sell their gas on a basis which would best serve "public convenience and necessity."

Hall called for regulation of field prices from the outset so "there would be no necessity for distortion of cost, incremental rates, and the like." To this end, he said that once the FPC determines what is the just and reasonable rate for a particular producer, that producer can thereafter be permitted to charge the same rate in later certificate proceedings because when the single rate applies to system-wide operations and costs, facts relating to a particular sale are not a direct complication of the rate. For this reason, he said, pipelines and distributors are able to apply for and render additional service without requesting rate increases.

Province-to-province gas sale proposed

Britalta Petroleums Ltd. is selling its undivided one-half interest in leases in a southeastern Alberta



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can cut your pipeline costs

Did you ever try to solve a jigsaw puzzle without first looking at the total picture the puzzle makes? Pretty difficult—maybe even impossible. Best way, easiest way is to look at the big picture first, then see where the individual pieces fit.

It's the same with pipeline control.

First, look at your total system problem. Then, determine what sort of control system is required to safely, reliably and economically meet tomorrow's need as well as today's. That is Union Switch & Signal's approach to pipeline control.

Any part of a pipeline system. Union Switch & Signal can incorporate in a centralized control system any or all of the following functions: supervisory or remote control of satellite stations . . . telemetering of flow data from field back to your central dispatching office . . . automatic sequencing or control of equipment in the field . . . instrumentation . . . data handling and display . . . computing equipment . . . automatic integration of field data into your accounting operations . . . communications. Union Centralized Transport Control can be adapted to *any* problem from remote control of a single-unit booster station for gas or oil to automatic centralized control of an entire system from wellhead to ultimate consumer.

Error-free. Whatever the job assigned to it, Union Centralized Control operates completely free from error because it reduces to coded digital form all information and instructions transmitted to or from your central control office. As a result, you can transmit far more precise data than ever before; you can use the least expensive available communications service; and you never need to worry about lightning, noise or other interference causing a wrong or dangerous operation—this coded system automatically checks itself and responds *only* to correct and logical signals. It helps make your pipeline safer. It provides error-free *security* as well as reliability.

Lower operating cost. Most important, Union Centralized Transport Control cuts your operating costs, cuts the cost of future expansion, sometimes even cuts present installation cost of pumping stations.

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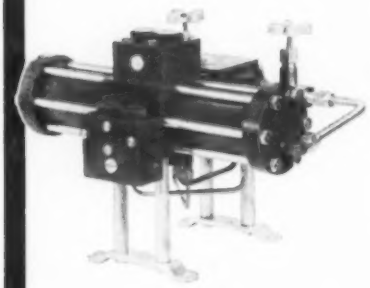

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4015 PV	40 gph	1500 p.s.i.
9015 PV	90 gph	1500 p.s.i.
21015 PV	210 gph	1500 p.s.i.
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gas field, along with 31 wells in the field, to Saskatchewan Power Corp. The $10 million deal involves some 153,000 acres in the Many Island Lake gas field.

Producing and gathering the gas will be done by Many Island Pipe Lines Ltd., an Alberta company owned by Saskatchewan Power.

The agreement marks the first time that a Canadian government-operated company has contracted to buy gas properties located in another province.

Crescent Oil & Gas Co., a Tulsa, Okla., company, is holder of the other undivided one-half interest in the Many Island Lake leases. It is currently negotiating with Saskatchewan Power to sell its interest. Final approval of the Britalta sale is contingent, among other matters, upon the agreement between Crescent and Saskatchewan.

Also a condition of the Britalta-Saskatchewan deal is the successful conclusion of a planned agreement between the power corporation and Trans-Canada Pipe Lines Ltd. This calls for the sale to Trans-Canada by Saskatchewan of gas from the Many Island Lake properties.

Final approval depends on the Alberta Oil & Gas Conservation Board. The board must issue a permit covering the production and exportation of gas from the reserves. The permit must contain a reservation to retain gas within the province of Alberta for future sale to the City of Medicine Hat or other communities in the area. The transaction also must be approved by the government of the province of Alberta.

GAS • Pipeline Notes

Texas Gas Transmission Corp., Owensboro, Ky., is now listed on the New York, Midwest, and Pacific Coast stock exchanges. Identifying symbol on the trading floors is TXG. Texas Gas, with about 17,000 stockholders located in every state and several foreign countries, is listing 3,000,214 shares. Net earnings for 1958 were $6.87 million, or $2.06 per share, on the 2,929,833 shares outstanding then.

Garrett Oil Tools, division of U. S. Industries Inc., has two new agents handling sales of its equipment. MechanEquip Inc., Dallas, is covering north central Texas. Western New York state is the territory of Bass Industrial Equipment Co., Buffalo.

Construction is under way on what may become the largest single underground storage reservoir for LPG in the nation. Texas Eastern Transmission Corp. is building the reservoir near Houston. Two "jug" wells are being drilled. When completed this fall, both wells will aggregate a storage capacity of 42 million gal.

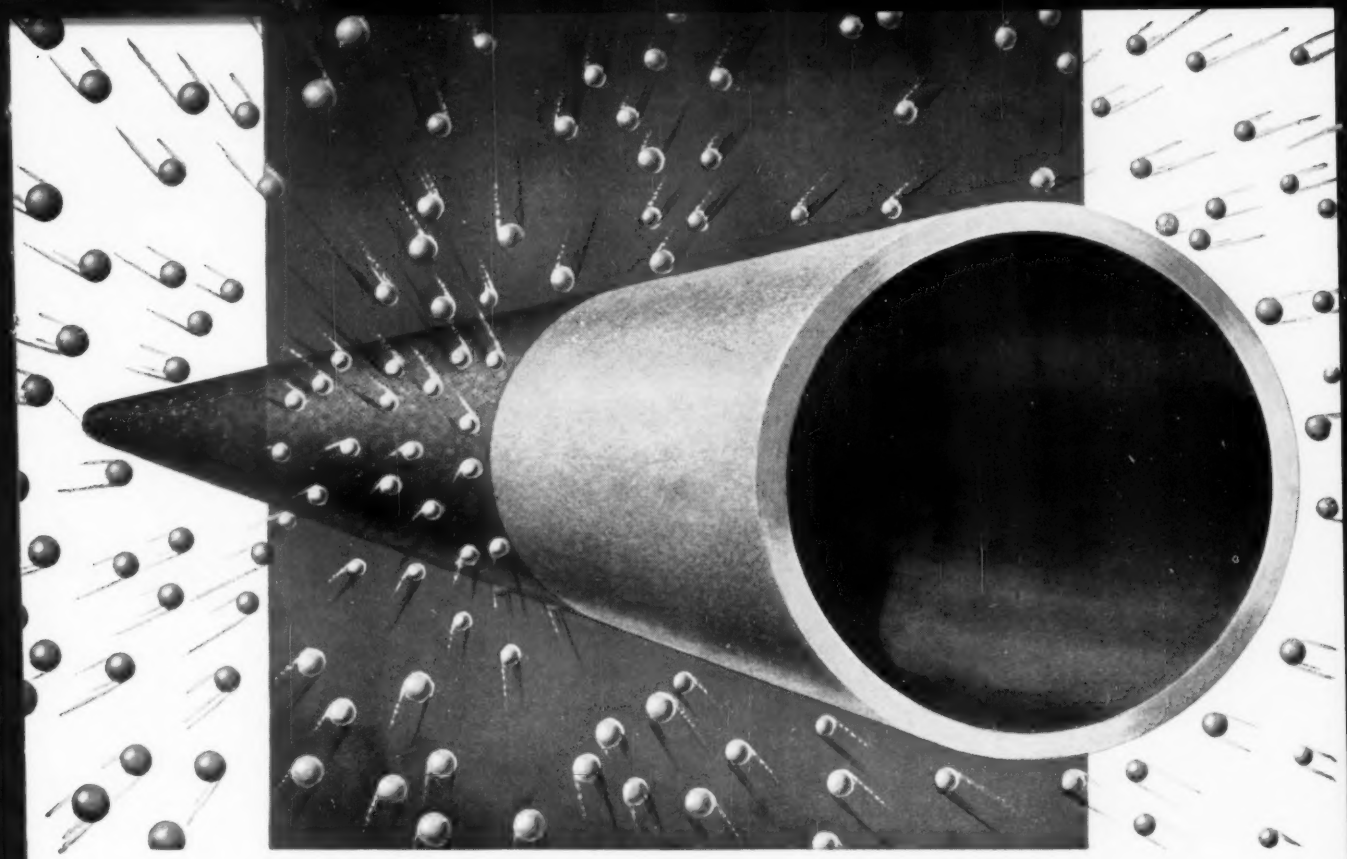
Walworth Co., New York, has completed negotiations with Midwest Piping Co., Inc. for the manufacture of Walworth welding fittings. Midwest headquarters in St. Louis. Products to be made by Midwest include complete lines of elbows, reducers, tees, caps, laterals, etc.

Manufacturers Light & Heat Co., Pittsburgh, has FPC approval of its plan (Docket G-17555) to construct a 60-mile, 20-in. line and a 700-hp portable compressor station at a cost of $5.3 million. Building is being done in several Pennsylvania counties.

Hope Natural Gas Co.'s $2.1 million construction plan in West Virginia has FPC approval (Docket G-17588). Covered are two metering stations and appurtenant facilities in Wetzel and Monongalia counties. The new line will replace two 16-inchers which Hope will abandon.

Equitable Gas Co. wants to spend $1.2 million in West Virginia and Pennsylvania on new pipeline and compressor equipment (Docket G-17871). Included are about 12.5 miles of line paralleling part of the company's existing system in Harrison and Marion counties, W. Va., and an 880-hp compressor unit at Equitable's Pratt station in Greene county, Pa. The new facilities will increase deliverability of its present gas supply system by 12 MMcf per day.

Budget-type construction plans have been filed by Natural Gas Pipeline Co. of America and El Paso Natural Gas Co. NGPL's plan in Docket G-17242 is limited to $1 million. El Paso plan (Docket G-17257) covers 30 mainline taps, up to 15 meter stations, and two lateral or branch lines. Through these facilities, El Paso will sell about 1.9 billion cu ft to existing customers in Texas, New Mexico, and Arizona.



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Applying protective coatings to improperly prepared pipe surface makes about as much sense as building a skyscraper on sand. Pipe Line Service has always pioneered in developing new ways to insure a good bond . . . a bond that makes protective coatings practically inseparable from the pipe itself.

An outstanding example is steel shot cleaning. Special machines permit bombardment of the pipe surface with millions of steel pellets traveling at high speed. Result? Not simply removal of mill scale and rust . . . but actually an "etching" of the steel surface. This slightly roughened surface allows the protective coating to "take root"—gives you the years of protection that you should have.

We emphasize Pipe Line's steel shot cleaning process because it was one of the great steps forward in maximum protection of *your* pipe investment. It's a manufacturing extra that's provided at no extra cost . . . and one more reason for extra confidence in specifying protection by PLS!

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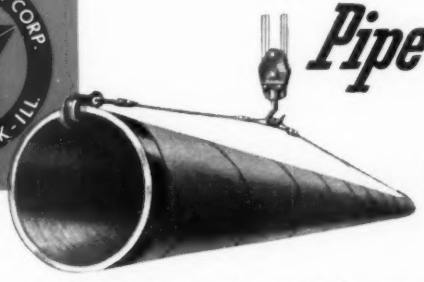

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GAS Pipeline People

W. W. COFIELD has been named to the newly created post of assistant superintendent of the measurement department of Transcontinental Gas Pipe Line Corp., Houston. Formerly he was senior engineer in the pipeline department.

Organizational changes in Northern Natural Gas Co.'s gas supply department have resulted in the following promotions: REX D. FOWLER to assistant manager of gas supply, G. L. TRIBBLE to manager of gas purchased operations, M. A. WILSON JR. to manager of gas purchases, and W. E. AINSWORTH to coordinator of gas supply. Ainsworth will be transferred temporarily to Calgary, Alberta, to open a gas supply office there.

Foxboro (Mass.) Co. has appointed R. MILHAM and G. H. GLEASON to administrative posts in the company's international division. Milham is now manager of international sales. Gleason will assist with international operations.

Buflovak Equipment division of Blaw-Knox Co. has opened a sales office in Houston. HAROLD R. KIBBY transfers from Birmingham to represent Buflovak in the new office.

JOHN WAMPLER has been appointed manager and RALPH MARSH assistant manager of the pricing department of the Youngstown (Ohio) Sheet & Tube Co. Wampler succeeds R. E. WILLIAMS, who recently retired after 48 years with the company.

ROBERT N. CURRY has been appointed assistant superintendent of gas measurement for Texas Gas Transmission Corp., Owensboro, Ky. Curry has spent nine of his 10 years with Texas Gas in various measurement department positions, including those of meterman, district measurement supervisor, division superintendent, and supervisor of measurement office.

D. B. GOOCH has been appointed district sales representative in Birmingham, Ala. for the Buflovak Equipment Division of Blaw-Knox Co.

KENT J. WORTHEN has been named to the newly created post of manager of product planning for point-to-point communication at General Electric communication products department in Lynchburg, Va.

CLIFTON D. CAMPBELL has been named superintendent of communications for the Houston Corp., Coastal Transmission Corp., and Houston Texas Gas & Oil Corp. He will headquarter in St. Petersburg, Fla.

PERRY F. ROYS has been named manager of area development for Northern Natural Gas Co., Omaha. He will coordinate activities of Northern's industrial and community development sections.

S. C. SANDUSKY has been appointed supervisor of the engineering and contracts department of Ohio Oil Co.'s natural gas division in Findlay, Ohio.

F. W. LAVERTY is the new president of Clark Bros. Co., division of Dresser Industries, Olean, N. Y. He succeeds J. N. MACKENDRICK, who has become chairman of the board. Laverty has been executive vice president of Clark Bros. since 1953. Before that he was sales manager. He joined the company in 1927, working in the foundry. MacKendrick, president since 1953, joined the company in 1928. In his new post, MacKendrick replaces C. PAUL CLARK, who has been given the post of honorary chairman.

R. N. Curry
Texas Gas

F. W. Laverty
Clark Bros.

J. N. MacKendrick
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- **Automatic Switchover-Switchback** . . . provision available for bi-lateral switching where desired.
- **"Hot" Standby** . . . enables switchover to pre-heated unit in less than one second.
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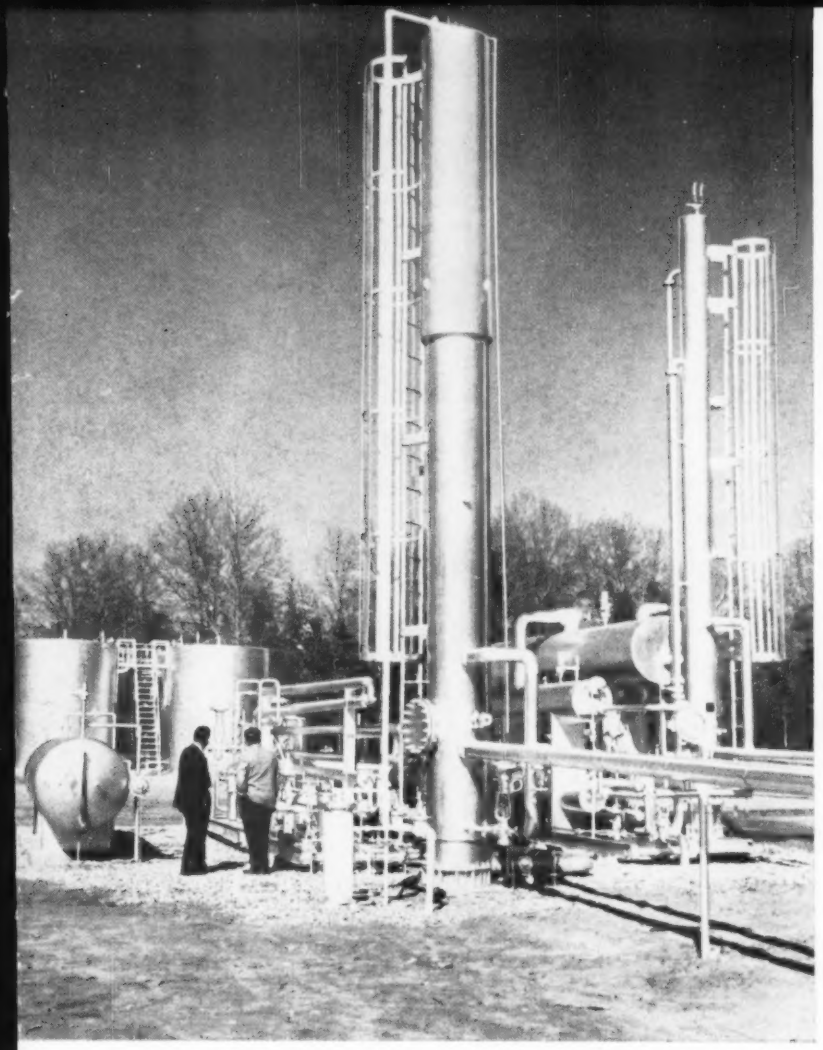

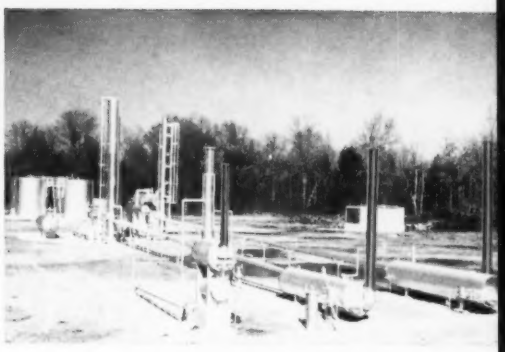

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Inlet pressure	1350
Inlet temperature	150° F.
Sales pressure	700
Low temperature separator	0° F.
GDH stock tank recovery	74.5 bbls. per MMSCF/D
Standard separator test (600 at 70° — stock tank recovery)	53.5 bbls. per MMSCF/D

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